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GAS JOURNAL

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[Founded in 1849 as the "Journal of Gas Lighting."]

Vol. CXLIII. No. 2887.] LONDON, SEPTEMBER 10, 1918. [70th Year. Price 6d.

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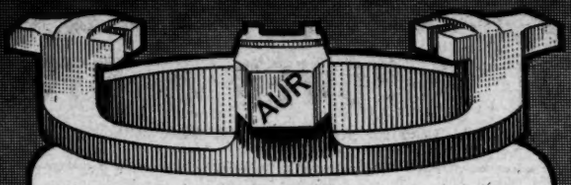

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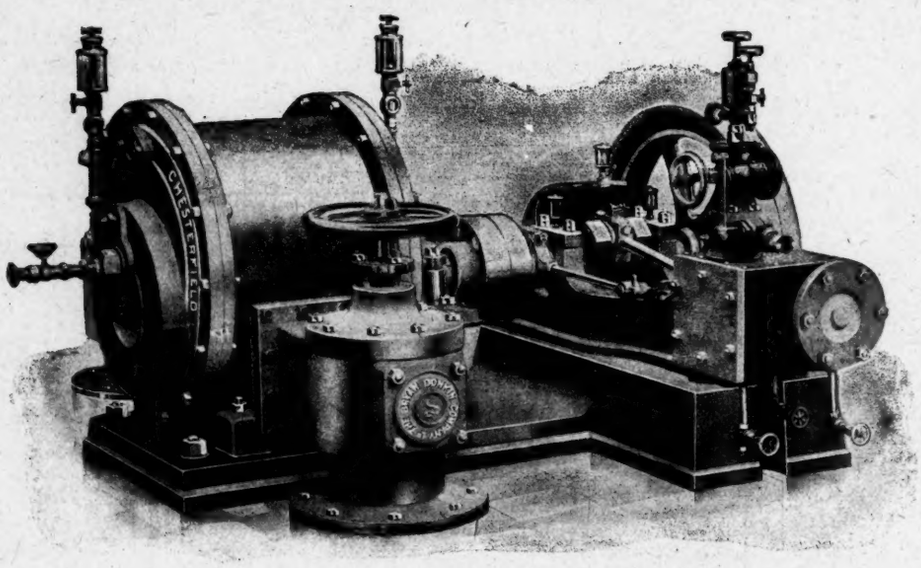

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EDITOR & PUBLISHER: WALTER KING. OFFICE: 11, BOLT COURT, FLEET ST., LONDON, E.C. 4.

VOL. CXLIII., No. 2887.] TUESDAY, SEPTEMBER 10, 1918. [70TH YEAR.

EDITORIAL NOTES.

Movements in the Industry—Views from Scotland.

THE power of criticism and open speaking is not a largely developed trait in the gas industry. If it had been, there would have been occasions lately when there would have been a veritable flood of very plain criticism. The reason for the silence of men who ought to move in the interests of the industry, and who ought to assist to energize affairs, is perhaps due to ancient custom, to excessive caution, or to old-fashioned preference for something approaching red-tape procedure. Whatever the cause, the fact is as described. In some other industries, there is open agitation, and effective result; and there exists the power behind that drives matters home. Now and then, there come signs of life from some quarter of the normally politically quiescent ranks of those in official position, and from a quarter perhaps the most unexpected.

Galston (Ayrshire) Gas-Works are not large; but they are managed by an officer with an extensive outlook—Mr. Robert Muir—who last week was in the Presidential Chair of the North British Association of Gas Managers. In his address, Mr. Muir had something to say upon matters of significance to the gas industry in connection with both current working and its political and economic position; and he said it tersely and well—so well that if some persons in high places could spare time to read the comments, they might find in them a "cap" that fits, and be somewhat astonished to learn that their critics extend so far away from Whitehall and other parts of London. If criticism comes from Galston, how many men must there be between there and London who likewise disagree with much of what has been, and is being, done in the Metropolis in the ordering of our daily lives, and in preparation or otherwise for the larger life that there is to be in a world the work of which is undergoing entire reconstruction. There are people who look upon all the talk as to reconstruction as idle—as being something that is merely visionary, and that the upshot of it all will be a drifting-back to old conditions along (so to speak) the same old river courses with their innumerable backwaters. Let them continue so to think. Those who entertain the contrary opinion are the men of constructive ideas with constructive goals; they are the real builders of industrial and national prosperity. Mr. Muir, in few words, shows that he is concerned as to the want of movement in the gas industry. This is not astonishing. Movement to alter things of permanent importance is being made; but we should like to have seen ere this something more positive before the industry, instead of a position which is entirely the fruit of procrastination, which procrastination has given an opportunity to gain a lead by those of our competitors showing greater activity.

"What has impressed itself on my mind," said Mr. Muir, "is that for some time past the electrical industry has been "preparing for a great effort to effect economies and to centralize its interests. A great deal has been written as to "the possibilities and value of a cheap supply of electricity "for power. This is readily admitted. *What is not quite so "satisfactory is as to what efforts, if any, the gas industry is "making in the same direction.* . . . I am satisfied that "the policy to be followed for the national prosperity is that "which will make use of the gas industry as the best means "to this end." All true, as is more in the address of the same kind. But the fact is that when there are opportunities for the gas industry, they are unerringly missed. An instance was given by us when criticizing, in our issue for Aug. 27, the report of the Carbonization Sub-Committee of the Coal Conservation Committee of the Ministry of Reconstruction. There was a fine opportunity there—in pages succeeding the Electric Power Sub-Committee's report—to show the progress that the gas industry has made in the carbonization sphere, and the potentiality of the industry in subscribing to the national welfare. The gas industry has not had a single voice among the numerous Departmental Committees that have hitherto been appointed; but electricity has been pushed to the front on every conceivable occasion. The gas industry is held back by indifference; and what the electricity industry is doing is pooh-poohed as being of little or no concern to the gas industry. "Financial "hardships" did not grow in a night, the same as the celebrated Jack the Giant Killer's beanstalk; but before the National Gas Council had birth, there were men who asked "Why trouble about unavoidable effects due to the war?" who spoke of the inappropriateness of making applications to Parliament during war time, who shelved the matter, and who congratulated themselves upon their wisdom in doing so. Then the *débâcle*, and almost sudden action, through the intervention of the National Gas Council, to save something. Is this sort of thing to be repeated? Is the great work of reconstruction to go forward and the gas industry to lay claim to be allowed to climb into it when other industries—far-seeing, active, and persistent—have moved well forward? Is the revision of financial terms that Sir Albert Stanley has foreshadowed to come along, and find the gas industry unprepared to take part in the discussion? Is the gas industry going to accept the attitude taken up by the Carbonization Sub-Committee—that the industry is too busy now with its immediate problems to take thought for the future. In that way lies disaster. Always the same old tale—always the same old excuse. The industry, according to the silent Sub-Committee's report, is too busy to say anything for itself, or even to put in a word as to its future. There is work to be done, and those few who are moving should be supported whole-heartedly by the industry. Those who prefer that the industry should stand still, while others are moving, had better be left behind, dealing with those things that monopolize their attention more than the future. Other men than Mr. Muir in little Galston are observing and wondering.

There are many other points in the brief address that should be noted by men of authority, as well as by others. In connection with coal conservation, Mr. Muir is doing his small part by steaming the spent charges in his horizontal retorts. A matter that should be constantly poured into the ears of householders and manufacturers the country through is concisely put when the President says that a ton of coal when carbonized in a retort, with its yield of gas, coke, tar, ammonia, benzol, toluol, &c., is of considerably more value—in the national interests—than a ton of coal used in the domestic grate or steam-boiler. In connection with fuel-rationing, too, there are certain remarks which indicate the view that the responsibility of the Coal Controller is greater to the Ministry of Munitions than in any other direction. That Sir Guy Calthrop fully appreciates this is not manifested by his allowances of electricity and of gas per ton of coal. We hope, with Mr. Muir, to see an increase in the gas-fuel ration where the ability exists to cope with an extra allowance per ton of coal not used by householders. But whatever truth there may be in calculations that have been made as to equivalents, there is nothing to be gained by letting our wants and hopes fly to equivalents which the existing gas-works plant is incapable of bearing. Of this, however, we are well convinced, that the Coal Controller has not, in fixing his ration, taken into account those gas

consumers on the prepayment system, as well as the smaller ordinary consumers, whose fuel requirements exceed the limit that is immune from rationing. In many working men's homes, and in the houses of the middle classes, in different parts of the country, there has been, through the needs of the country, a vast depletion of household labour; and labour-saving gas and not labour-creating coal has been called upon to assist in making amends for this. There will be a great deal of unpleasantness in this direction which is likely to increase the discomfort of the position of the Coal Controller.

On the Track of Higher Carbonizing Efficiency.

THE William Young Memorial Lecture, which Prof. J. W. Cobb delivered at the meeting of the North British Association, has conspicuous value not only on account of its directional importance in connection with the development of carbonization results, but because—this, of course, secondarily—it affords confirmation, both chemical and physical, that the lines that have recently been taken, more or less empirically, in promoting carbonizing efficiencies are correct ones. Perhaps there is no other technically controlled industry in existence that has lost more in the past than the gas industry through pursuing (with simple faith that the best was being done) the beaten paths of practice, instead of calling to its aid the work of scientific research. But it must be so no longer. Gas men must now, as Prof. Cobb intimates, have a broader outlook than that which, until comparatively recently, has circumscribed their work and practices; and this broader outlook can only be obtained by personal qualification secured through a higher mental equipment. Our intellectual deficiencies have come home to roost; and they must for all time now stand only as a page in the history of the industry, and be displaced by opposite conditions.

At the same time, in connection with a subject of such complexity as carbonization, there must be warning against relying too much on laboratory revelations, without the ratification of working-scale experiments, because, as is seen as the lecture is traversed, however carefully laboratory research is made, it is not reproductive of conditions or results such as are provided by higher temperatures, bulk of material, and more particularly the complex gaseous atmospheric state that plays such large part in chemical reactions in ordinary retorts. But laboratory investigation must not be barred. It constitutes, so to speak, the rudimentary work which is informative as to what may be expected to occur under specific conditions; it enlightens, too, as to the different behaviour of a given gas or substance under diverse conditions; and it is suggestive. It is, in short, the groundwork that must be undertaken for information and suggestion preliminary to large-scale experiments, which are necessary, as the lecturer proves by illustrations with benzene and toluene, owing to the differences of conditions already referred to. This view is what might have been anticipated from one occupying the position of Prof. Cobb at the Leeds University, where the major work is to bring about the intermingling of science with practice in industrial operations; and to do this effectually is not by relying on laboratory work alone, but that work *plus* research and practice under actual working conditions. This is one of the safeguards that we have in connection with the investigation that is being made—largely under the direction of Prof. Cobb, in association with the Institution of Gas Engineers—into the question of the composition of gas. Laboratory and working-scale researches are being combined. When this work is remembered, there is much in the lecture that is highly satisfactory, as Prof. Cobb would not have gone the length he did in it in confirming the scientific soundness of the more recent development in practice of passing into the charges of retorts steam or blue water gas, had he not in his possession the necessary proofs—"scientific soundness" not only in raising quantitatively the production of gas, but in assisting in the preservation and yield of valuable constituents that would otherwise be lost by decomposition. At the same time, we must take it as a justifiably caustic comment on our methods of procedure in the past when the lecturer tells us that, with all the data at command from different forms of carbonization, the gas industry has not at hand the information required for the solution of the most elementary problems.

As to the studies that Prof. Cobb has made (in conjunction with Dr. Dufton) into the decomposition of benzene and toluene under the action of heat, they show distinctly what differences may take place between laboratory experiments and actual large-scale working, due more particularly to the differences in the gaseous atmospheric conditions inside the retorts. The experiments prove that nitrogen is no friend to benzene, while hydrogen is—nitrogen favouring its decomposition, while hydrogen limits it up to a certain temperature point below ordinary retort carbonizing temperatures. In the laboratory experiments, at a temperature of 800° C., diphenyl was freely produced from benzene, while in working at the same temperature under ordinary carbonizing conditions there is an almost complete absence of diphenyl, which shows that ordinary carbonizing conditions, at that temperature, almost nullify the decomposition of benzene, though at higher temperatures there is decomposition. This is, of course, a well-known point, which is to that extent favourable to low-temperature carbonization. But we have to consider the results of carbonization as a whole, and make some compromise with conditions in order to realize the best commercial results per unit of work done or material handled; and the vertical retort, with graduated temperatures, and the admission of steam or blue water gas, gives excellent ground for anticipation as to further developments so as to secure a larger range of products from the one process. As to toluene, the studies show that with nitrogen as the carrier, even at as low a temperature as 550° C., there was fairly considerable decomposition, while at a temperature of 750° C. the decomposition was quite extensive. Hydrogen as the carrier accelerated the decomposition (increasing it with rising temperature), with, however, the production of larger quantities of benzene, and a small amount of condensates. In other words, although the presence of hydrogen, as in carbonizing practice, lessens the formation of molecular condensates, it promotes the decomposition of toluol by reducing it to benzene, which it also tends to preserve.

The investigation clearly discloses why the carbonizing process can never be regarded as a simple effect of heat, independent of the gaseous atmosphere in which it is conducted; and it also points to the way in which we may hope to modify the results of carbonization in various directions by the deliberate control of the gaseous atmosphere inside the retort. This is the view of Prof. Cobb; and we also quote him when we say that the experiments lead to quite a definite conception as to how hydrogen might exert its influence in preventing and minimizing the decompositions which are of the nature of molecular condensations, and how hydrogen may promote decompositions tending to simplify molecular structure by combining with attached groups and promoting their detachment. This brings us to the point as to modern developments in carbonization practice, by the introduction of steam or water gas in regulated quantities into the retorts, which Prof. Cobb kindly regards as a recognition by gas men of the importance of applying the principle of atmosphere to carbonization. We rather think that what has been done in this connection has been with the view to increasing production, and that the presence of important collateral benefits only dawned upon the operators when inquiring as to why the improved gas yields were realized with so little loss of calorific value, and no loss to the useful application of the gas. His explanation is that hydrogen (being light) has great diffusive power, its molecules travel a zig-zag path at a high speed, it penetrates the pores of the coke, hastens away the volatile products from the region of decomposition, and assists in their volatilization. But the all-important action is chemical; and other gases cannot be expected to exercise the same chemical influence. The anticipated general effect of the ascending gas stream is that of lowering the average molecular weight and physical density of the heavier products of carbonization, while increasing the yield of the gas and of the lighter constituents in the tar. With these points in mind, Prof. Cobb sees in the results achieved by vertical retorts with steaming, the direction in which, from the one process, there may be secured a larger variety of products of different values. There are one or two practical points in this connection. He favours the admission into the charges of blue water gas rather than steam, on the ground that heat has to be supplied in either case for the decomposition of the steam by carbon; and it is undoubtedly cheaper to supply this heat on the water-gas plant by the combustion of a portion of the carbon in air than it is to convey the necessary heat through the walls of a retort. Moreover, unless (as Mr. J. E. Blundell recently showed) the temperature inside the retort is high, the water-gas reaction occurring there is liable to produce an incon-

venient amount of carbon dioxide. On the other hand, the steam has an advantage over water gas in the production of ammonia; and in this connection, the lecturer, like others before him, points to the need in the interests of the industry (particularly in view of the threatened new competition in fertilizers) of recovering as ammonia at any rate part of the 50 p.ct. of nitrogen left in the coke.

This comment and review do not compass all that there is in this William Young Memorial Lecture, which has a distinction for, and considerable value to, the industry in that it focuses the lines along which modern carbonizing progress has been and is being made, and which lines have the ratification of a scientific mind, supported by experimental study. Manufacturing economy for the gas industry largely lies in increasing the yield of products per ton of coal without depreciating the serviceable value of the primary product, which is not always to be measured by the commonly applied standards. We congratulate the North British Association upon having drawn from Prof. Cobb such an edifying account of the carbonizing position and prospects. It shows the industry is on right tracks, though some of its professional men have yet to be educated up to the belief that this is so.

The Coal "Danger Line."

WHAT the Coal Controller describes as the "danger line" of coal supply has undoubtedly been reached; and if the output is not increased and the consumption decreased, the outlook, he says, will be "very black" for the approaching winter. Not only by word, but by act, Sir Guy Calthrop is impressing the seriousness of the situation in all directions. He is bringing to his aid all possible influences to circulate the gospel of coal economy. The Local Government Board have communicated to the local authorities throughout the country an appeal for support and assistance in the Government's efforts to secure economy in the use of coal, and to themselves set an example in their buildings, premises, and streets. Placards are appearing on the London hoardings urging the public to exercise economy; and Mr. Gompers, the American Labour Leader, is appealing to the miners. There is need for it all. During the thirty-two weeks of the current year, the output of coal has fallen in contrast with the same weeks of last year by 13½ million tons, or 8·7 p.ct. Yet France wants still more; the American Expeditionary Forces require more; and in Italy there is gloominess over the fireless days that will have to be faced during the winter, especially during the severe cold in the northern parts of the country, unless we can render more substantial help. It is a race now of the utmost gravity against winter. The Coal Controller is fully conscious of the shortness of coal stocks throughout the country. He admits that gas and similar undertakings should have at least six weeks' stock in hand. But they cannot have what does not exist. He hopes they may get four weeks and electricity undertakings three weeks; but he makes no promises. The ugly thing is that the shortage of stocks is general. In his Presidential Address to the North British Association of Gas Managers last Friday, Mr. Robert Muir stated that returns from 122 gas-works in Scotland indicated that, at the end of July this year, the aggregate stocks showed a reduction of no less than 58 p.ct., compared with the end of October last year. A return from the gas-works in England, Wales, and Ireland would show a like gravity as to the position of stocks. The responsibility of the Coal Controller to-day is as great as that of any man in the country.

Raising New Capital on the Easiest Terms.

THERE is a short article in a succeeding column by Mr. Henry Johnson, the Chairman of the Romford Gas Company, which is well worth the attention of other gas company directors, because of the suggestions that it contains in regard to the question of gas companies getting hold of capital on the very easiest terms. For our own part, we welcome the article not only on account of its proposals, but because, finance being at the base of the industry, as in all commercial undertakings, we are glad to have one who has to deal administratively with it showing initiative, and offering his ideas for the consideration of his fellow-directors throughout the industry. In the first place, Mr. Johnson points to the inconsistencies of the Government in regard to three-quarters of the standard dividend of 3½ or 4 p.ct. of gas companies being sufficient for maintaining the financial stability of the undertakings, while acknowledging that the Government themselves must to draw money offer 5 p.ct. on War Loans and Bonds with the Government security behind them for repayment, and that gas companies must have the right to pay 6 p.ct. interest on short-term redeemable bonds in order to raise new capital. This acknowledgment should afford strong support to any case that may be put forward in furtherance of the proposals our contributor makes for raising fresh capital.

The first suggestion is in respect of those companies that have issued 4 p.ct. bonds, and have a balance in hand still to be issued, but cannot be under present market conditions, and at such a rate of interest. How to make these bonds attractive, without imposing any more burden upon the undertakings than is necessary, is Mr. Johnson's primary consideration. Interest at the rate of 5 p.ct., in competition with Government Bonds bearing the same rate of interest, would not induce outsiders to come in at the present time; hence the idea that parliamentary sanction should be sought to the issuing of the 4 p.ct. bonds as 5 p.ct. to the *present holders* of 4 p.ct. bonds, and to convert from 4 to 5 p.ct. an amount of the existing holding equal to the amount of the new issue taken up. This would be a sound policy. Abnormal difficulties require abnormal treatment; and the idea should commend itself to Parliament perhaps with greater force than the 6 p.ct. redeemable bonds. If anyone had cause to complain, it would be the holders of the 4 p.ct. stock who were not in a financial position at the time of issue to take advantage of such a favourable offer. But, on the other hand, their objection is met by the fact that, if a company must have additional capital, it would be better to adopt this plan in the first instance than to have bonds issued bearing a heavier rate of interest. The gas consumers could have no valid objection, in view of the fact that the cheapest obtainable capital is to their interest. Even objection as to permanency of the extra 1 p.ct. would not hold good, as money is not going to fall to its old levels of value for many a long year—if ever under the new order of things that is now being fashioned out of the chaos of war.

Again on the ground of abnormal conditions, a second suggestion is that the one-fourth or one-third part of the issued capital as the limit to which money can be borrowed, might be dispensed with, till ordinary shares or stock can again be issued at a reasonable price. A third proposal is that perhaps the Government, in view of the national service rendered by the industry at prices that are ridiculously low in view of material and labour costs, would be willing to lend gas undertakings money at the rate of 5 p.ct. We should not look very hopefully in this direction. But there can be no harm in making the attempt, and every justification is available.

There is matter in Mr. Johnson's article for consideration and discussion; for the "relief" given to the gas industry by Parliament is of such an order that the credit of the gas business has not been much improved thereby. Thus the need for examining this question of capital-raising from every point of view—not only in respect of immediate requirements, but in order to meet the needs that are likely to fall thick and fast when the final scenes on the battlefields have passed.

Gas Divisional Officers under the Rationing Order.

In connection with the Fuel and Lighting Rationing Order, an important announcement is made on a succeeding page, regarding the appointment by the Coal Controller of Divisional Officers—whose names and addresses are published—for the gas industry. These officers will be found of great value in facilitating negotiations over matters in regard to which there may be difficulty and hindrance in realizing a settlement. The Divisional Officers, as accredited agents, are pledged to do their best to hasten and to make smooth the rough places in getting the Order, so far as gas and coke are concerned, into effective operation. It will be seen that the Divisional Officers appeal to every gas engineer and manager to actively help to this end. While some districts are doing very well, there has been regrettable delay in others; and this only assists to make the troubles of to-day all the more overwhelming.

Steaming at Macclesfield.

Steaming the charges in vertical retorts on the methodical lines developed by Mr. J. E. Blundell, at Macclesfield, largely accounts for the notable results achieved by the Corporation Gas

Department last financial year. The coal used amounted to 12,915 tons; and no oil or coke being employed, the savings were: Coal, 116 tons, oil 112 tons, coke 254 tons. These savings notwithstanding, the make of gas was 207,367,000 c.ft., or 9,549,000 c.ft. more than in the financial year 1916-17. The gas made per ton of coal was 16,056 c.ft. of 476 B.Th.U. gross; while the gas sold was 14,679 c.ft. Including sinking-fund, interest, and plant reconstruction, the total net expenditure last year was 2s. 2·99d. The figures are presented in the annual accounts without comment. But gas men throughout the country will see their significance; and when working results are checked and confirmed by money payments, where are the openings for dispute?

Organized Research a National Asset.

Parts of the report of the Privy Council Committee for Scientific and Industrial Research were noticed in the "JOURNAL" last week. Reading the other parts, one is struck by the determined effort that is being made by the Council to so organize scientific research that it may become a positive national asset. It is seen that the Council have, as from April 1, assumed responsibility for the maintenance and development of the National Physical Laboratory. Then in addition to the Fuel Research Board, they have now a Food Investigation Board at work, as well as a Tin and Tungsten Research Board. A series of tests are being made in connection with home-grown timber. Satisfactory progress is also being effected with Industrial Research Associations, in connection with which is the fund of a million sterling which is to be expended in a period of five or six years in grants to approved Associations. Beyond, the Council have considered and approved recommendations in respect of aid to twenty-one scientific investigations of industrial importance which are being conducted by other bodies. Allowances have been made to twenty-five students under training in methods of research, and to thirty-six workers who are either undertaking independent researches or acting as assistants to research workers. There is no question that the value of the Council to the nation is beyond all comparison greater than its cost, and will as time goes on bring to the country continually augmented returns. The foundations of a national system of scientific research are being truly laid. In the final structure as it is being planned, the Universities, technical colleges, learned societies, and industries will all be found taking their due places. In short, through the Council, organized and systematic research will soon be covering a large area of the country's interests.

Crude Gas Liquor and Spent Oxide as Fertilizers.

Abstracts appear in the current issue of the "Journal of the Society of Chemical Industry" of two articles in a recent issue of the "Journal für Gasbeleuchtung." It is pointed out that the growing shortage of supplies of sulphur in Germany necessitates the consideration of methods of making use of gas liquor other than in the manufacture of ammonium sulphate. In regard to the direct application of the liquor as a fertilizer, the presence of plant poisons—thiocyanates, tar acids, and bases, &c.—precludes its use as a top dressing. If the liquor is applied to the soil in the autumn, so as to allow a long interval before the time of sowing, it is possible that the harmful constituents are destroyed; but then the loss of nitrogen will be excessive. In the absence of definite experimental results, caution is advisable. The German paper points out that the presence of sulphur and cyanogen compounds, which are plant poisons, seems to stand in the way of the use of spent oxide as a fertilizer. Still, in France it is applied to the land in considerable quantities, especially in connection with vine culture—probably on account of its destructive action on pests. Transport restrictions render its disposal in Germany difficult; and an outlet in agricultural operations is sought, especially in view of its small ammonia content.

The Interferometer in Gas Analysis.—The United States Bureau of Mines report upon the Rayleigh interferometer, which makes use of the optical properties of gases, and is suitable for analyzing a binary gas mixture. The instrument is made in two different types—a laboratory model, with gas-chamber 1 m. in length, which is capable of giving results accurate within 0·20 to 0·03 p.ct., and a short or portable type where less accuracy is desired. The manner in which interference bands are produced is explained, according to the theory of Young; and it is shown that, other things being equal, the accuracy of the measurements depends entirely on the length of the gas-chambers. The greater the difference of the coefficients of absolute refraction in the gases employed, the greater is the accuracy of the method. It is stated that complete mastery of the instrument comes only from considerable experience.

THE HOUSEHOLD FUEL AND LIGHTING ORDER.

Appointment of Provisional Officers for the Gas Industry

FOR the decentralization of the work of carrying out the Fuel and Lighting Order, the Controller of Coal Mines has divided England and Wales into twenty division, and appointed a Divisional Fuel Overseer for each. To advise and assist these Divisional Overseers in all matters relating to the rationing of gas and coke, the following representatives of the gas industry have, on the nomination of the National Gas Council, been appointed by the Controller Divisional Officers (Gas) for their respective divisions.

Division.	Name.	Address.
Northern (East).	T. Hardie	Newcastle-on-Tyne and Gateshead Gas Company, No. 35, Grainger Street West, Newcastle-on-Tyne.
Northern (West)	S. Tagg	Preston Gas Company, Fishergate, Preston.
Lancashire	F. A. Price	Manchester Corporation Gas Department, Town Hall, Manchester.
Yorkshire (West)	Chas. Wood	Bradford Corporation Gas Department, Town Hall, Bradford.
Yorkshire (N. & E.)	H. E. Bloor	York Gas Company, Davygate, York.
East Midland	J. Wilkinson	Nottingham Corporation Gas Department, No. 6, George Street, Nottingham.
West Midland	C. M. D. Belton	Shrewsbury Gas Light Company, Gas-Works, Castle Foregate, Shrewsbury.
Midland	A. W. Smith	Birmingham Corporation Gas Department, Council House, Edmund Street, Birmingham.
South Midland	H. Pooley	Leicester Corporation Gas Department, Millstone Lane, Leicester.
Eastern Counties	J. W. Auchterlonie	Cambridge University and Town Gas Light Company, 52, Sidney Street, Cambridge.
Norfolk and Suffolk	T. Glover	British Gas Light Company, Ltd., Bishop Bridge, Norwich.
Central Counties	D. H. Helps	Reading Gas Company, King's Road, Reading.
Metropolitan Area. (Acting as an Advisory Committee to the Divisional Officer.)	F. W. Goodenough (Chairman of Committee.)	The Gas Light and Coke Company, Horseferry Road, S.W. 1.
	A. H. Kelday	Commercial Gas Company, Ben Jonson Road, Stepney.
	W. E. Price	Hampton Court Gas Company, Gas Works, Hampton Wick, Middlesex.
	W. J. Sandeman	Croydon Gas Company, Katharine Street, Croydon.
	A. Stokes	South Metropolitan Gas Company, 709, Old Kent Road, S.E. 15.
	E. R. H. Wingfield	Brentford Gas Company, High Street, Brentford.
	S. C. Colwell (Coke.)	The Gas Light and Coke Company, Horseferry Road, S.W. 1.
	A. E. Williams (Coke.)	Commercial Gas Company, Ben Jonson Road, Stepney.
South Eastern (Kent)	J. Donaldson	Tonbridge Gas Company, No. 109, High Street, Tonbridge.
South Eastern (Sussex)	W. J. Sandeman	Croydon Gas Company, Katharine Street, Croydon.
Southern	J. R. H. Jacobs.	Southampton Gaslight and Coke Company, Ogle Road, Southampton.
Western Counties	S. E. Halliwell	Bristol Gas Company, Colston Street, Bristol.
Devonshire and Cornwall	W. N. Westlake	Exeter Gas Light and Coke Company, Nos. 11 and 12, East Southernhay, Exeter.
Wales (Northern)	O. Evans	Wrexham Gas Company, No. 23, Salop Road, Wrexham.
Wales (Southern)	J. H. Canning	Newport (Mon.) Gas Company, Mill Street, Newport, Mon.

In the event, therefore, of any question arising out of the operation of the Order in connection with gas or coke, upon which the

local representative of the gas industry desires an authoritative ruling and cannot obtain such ruling from, or is not in agreement thereupon with, the Local Fuel Overseer, or which such representative feels should be brought to the notice of the industry generally, it is desirable that he should communicate with the Divisional Officer named above for the division in which his district is situated.

The Divisional Officers met on Friday last, prior to a conference with Mr. Frank Pick upon the question of coke prices and sundry other points, and resolved themselves into a Standing Conference, to meet as and when necessary to discuss matters referred to them, or arising out of the operation of the Order. Mr. F. W. Goodenough (who is Chairman of the Sub-Committee of the National Gas Council appointed to watch the working of the Order) was elected Chairman of the Conference.

IMPORTANT.

As a result of the meeting with Mr. Pick, the Divisional Officers desire to bring urgently to the notice of every gas manager in the country the importance of doing everything possible to expedite the work of getting the Order into operation—especially in the matter of promptly filling-in the required particulars upon and returning the Requisition Forms (F.H.F. 3) sent to them by the Local Fuel Overseer. While this is being done with commendable promptitude in the majority of districts, there are, it is understood, many in which regrettable delay is taking place. Managers are reminded that they are entitled to recover from the local authority all expenses reasonably incurred by them in carrying out this work; and it may be well they should understand that the giving to the householder, before he makes his requisition, such information respecting his previous usage of gas as would be likely to lead to his including a similar quantity (or substantial proportion of such quantity) of gas in his requisition, was arranged for in the forms issued at the instance and urgent request of the gas industry's representatives. It is not work imposed upon them by the Controller of his own accord. It is, therefore, hoped that every manager will make it a point of honour to get the work carried through without delay.

NATIONAL GAS COUNCIL.

Executive Committee Meeting.

A MEETING of the Executive Committee of the National Gas Council was held last Thursday, the 5th inst. Among other matters, the following were discussed.

Mr. W. E. Price (Joint Hon. Secretary) reported the steps which he had taken, at the request of the Committee, to bring to the notice of the Government the very serious state of the coal stocks of gas undertakings, and the insufficient supplies now being received—threatening the grave danger of a failure in the supply of gas during the coming winter. The attention of the Prime Minister was drawn to the serious position, and (as reported in the Daily Press) the War Cabinet have undertaken active propaganda work among the miners in order to convince them of the necessity for increasing to the utmost extent possible the output of coal per man.

It was reported that electric plant for cooking purposes is being installed in various Government hostels, often in substitution for efficient gas plant; and instances were laid before the Committee where, after a trial, the electrical plant was found unsatisfactory and abandoned. A Sub-Committee was accordingly appointed to inquire into the question, and report to the Council any steps that it was found possible to take. It was also decided to approach the Government in order to ensure that the gas industry should receive better priority facilities for materials required for extension of the use of gas for power and similar purposes.

Resolutions from District Institutions and Associations of Gas Engineers were submitted, regarding the formation of a Special Committee to investigate the position of the gas industry. A reply was directed to be sent, to the effect that action had already been taken in the matter which it is hoped will attain the objects that are desired.

A letter from the Ministry of Pensions, asking the gas industry to give preferential employment to disabled men discharged from the forces, and to set up Special Committees to work in conjunction with the Local War Pensions Committees, was considered. It was decided to inform the Ministry of Pensions that, while fully sympathizing with the object they have in view, the gas industry will have such a large number of its own employees returning from service with the colours (partially disabled) that they cannot undertake at the present time to offer facilities for training and employment to disabled men not previously engaged in the industry. With regard to the employment of discharged sailors and soldiers in meter-repairing shops, this might usefully be considered by the Society of British Gas Industries.

A communication from the Midland Commercial Gas Association regarding the desirability of obtaining better prices for concentrated ammoniacal liquor, in view of the Government "payments in aid" to manufacturers of sulphate of ammonia, was further debated, and referred to the Sulphate of Ammonia Association to consider what action can be taken in the matter.

It was reported that the United Kingdom Linseed Oil Consumers' Association were acting beyond their province in advising small buyers of linseed oil, &c., that it is necessary for them to become members of the Association before obtaining supplies. It was arranged that a representative of the Council should interview the Ministry of Food (Oils and Fats Branch), point out that the Association appear to be going beyond the provisions of the Defence of the Realm Acts relating to linseed, &c., and ask that the necessary steps should be taken.

Resolutions from District Institutions and Associations of Gas Engineers, suggesting that the operation of the Household Fuel and Lighting Order should not commence until the beginning of the September quarter, were submitted; and it was decided to lay the resolutions before the Controller of Coal Mines at a meeting of Divisional Officers advising upon gas to be held the following day—indicating that the various resolutions have the support of the Council.

Correspondence from Mr. J. Ferguson Bell, of Derby, was considered, in connection with the fixing of the price of coke for industrial purposes under the Household Fuel and Lighting Order. This matter was deferred for consideration at the meeting of Divisional Officers to be held the following day.

Mr. Jacques Abady (Counsel) and Mr. T. W. Seager Berry (Solicitor) were co-opted members of the Executive Committee, and will act in an advisory capacity to the Council.

OBITUARY.

The death has taken place of Mr. T. E. STILLARD, for over thirty years Secretary of the Dudley Gas Company. He was 64 years of age.

The death took place, on July 29, of Heer T. F. PETERS, the Manager of the gas and electricity works at Waalwijk, in Holland, at the early age of 35.

The death in action on Aug. 9 has been notified of Second-Lieutenant J. W. GIBSON, of the Tank Corps, who was killed instantaneously by a piece of shell. He was the son of Mr. James Gibson, the Gas Engineer to the Corporation of Mansfield, and was a Pupil Assistant with his father before joining-up with the Argyll and Sutherland Highlanders in October, 1915. Last year, he was gazetted to a Commission in the Tank Corps. He would have been twenty years of age this month.

PERSONAL.

At a recent meeting of the Leeds Corporation Gas Committee, the resignation of Mr. J. W. FELL, the Assistant Manager at the Meadow Lane works, was reported.

Mr. WILLIAM GRIFFIN, the General Manager and Secretary of the Folkestone Gas Company, has been appointed a Justice of the Peace for the Borough of Folkestone.

Sir ADAM NIMMO, K.B.E., has accepted an invitation from the Government to assist the Coal Controller in the administration of the coal control. The Government have also invited the Miners' Federation of Great Britain to nominate one of their members to assist the Coal Controller.

Mr. J. T. PRICE, the Manager of the coking plant at Manvers Main Colliery, and Hon. General Secretary of the Coke-Oven Managers' Association from its inception, has been appointed Manager of the new bye-product plant of the Redbourn Hill Iron and Steel Company, at Frodingham.

Dr. H. H. HODGSON, who has been appointed head of the new Coal Tar and Colour Chemistry Department of the Huddersfield Technical College, which is to provide specialized teaching for works chemists to meet the developments that have arisen out of the war, is a native of Bradford, and passed from the Bradford Grammar School to Trinity College, Cambridge, and thence to London, Zurich, and Heidelberg. He was Lecturer and Research Chemist at the Bradford Technical College for four years, and has for the past three years been Chief Chemist for one of the largest firms of chemical manufacturers in this country. He is author of many contributions to chemical literature, and has translated some valuable works.

To succeed Mr. R. S. Ramsden as Engineer and Manager, the Burton-upon-Trent Gas Committee have selected Mr. W. WILSON, at present Engineer and Manager of the Falkirk Gas-Works; and he is recommended for appointment by the Town Council this week. After spending some years at the Barrowfield Iron-Works, Glasgow, Mr. Wilson was successively Assistant Manager at the Coatbridge Gas-Works, the Perth Gas-Works, and in the meter works of Messrs. J. Milne & Son, Ltd., of Edinburgh. In 1901, he was appointed Gas Manager at Kirkintilloch, and six years later went to Falkirk, where he completed the erection of new works. Mr. Wilson has been acting as District Supervisor for the Ministry of Munitions Explosives Department, and is one of the Advising Engineers to the Coal Controller.

The August number of "Het Gas" records the fact that the previous month, Heer P. BOLSIUS, who is well known to a wide circle of gas engineers in this country, celebrated the fortieth anniversary of his entry into the gas industry and the thirtieth anniversary of his appointment as Manager of the Corporation Gas-Works at Bois-le-Duc ('s Hertogenbosch). He received the hearty congratulations of his colleagues at the recent annual

general meeting of the Dutch Association of Gas Engineers at Groningen. Heer Bolsius was born in 1859; was educated at Bruges, Culemborg, Liege, and Bois-le-Duc; and when only nineteen years of age, he took charge of the Bois Gas-Works in the latter town, in succession to his father. In 1888, he was appointed Manager of the new gas-works, built to the designs of Heer Kalff, at Bois-le-Duc. He has been one of the most active members of the Dutch Gas Association, of which he was President in 1904. He has been constantly associated with the production of the Dutch gas journal "Het Gas," and has been mainly responsible for the promulgation of the discovery of coal gas and its application by Minckelers in 1784—thereby anticipating the claims of Lebon and Murdoch. Our readers will wish Heer Bolsius a long and happy continuation of his work in the gas industry.

ELECTRICITY SUPPLY MEMORANDA.

IN the booklet recently issued by the National Kitchens Division of the Ministry of Food, there appears a little bias in favour of electricity. This pops out at the reader in several illustrations. Yet in the text the compiler of the information finds it impossible to say much in its favour; and, this being so, he says as little as he possibly can about gas Experience in the National Kitchens may.

Poor Testimony from the National Kitchens.

do the cause of electric cooking more harm than good; for it is plain that the strong pleasing exteriors shown by the illustrations of electric plant are no guarantee of their performances. For all purposes other than oven operations, the booklet supplies warning as to expensiveness and the necessity for careful attention; and there may be other revelations before long, unless the electrical people do as they have been known to do before, take good care to camouflage disagreeable incidents. At an hotel not far from London on a recent Sunday, a fuse or fuses "went" in connection with an electric-oven just at a critical time in the preparations for dinner. The manager thanked his lucky stars that he had not been so foolish as to have his gas appliances disconnected, as he would have been in what he forcibly described as an "ugly mess." His confidence was rudely shaken. What is said in the National Kitchens booklet in favour of electricity can be described as the surviving claims of the electricians, which, being the last, they dare not relinquish, while fearing to enter into any public competition on equal terms with the view to disestablishing them definitely—they knowing as well as we do that gas in the kitchen is the most flexible heating agent for all purposes, the cheapest, and the most reliable.

Half the Tale.

Electrical partizans have shown exceptional ability for indulging in a form of reasoning that does not take the public to the ultimate goal. Every time controversy is raised between gas and electricity, this is evidenced. Something is concealed or else avoided; but the final words are never written by electricians, as they would wholly damn the electrical cause. In connection with electric cooking, half the tale serves electrical advocacy; and, as we have shown, this half is often unpleasantly tainted. And the same with electric heating. An instance of the whole story not being told is found in the correspondence raised by Mr. Orme Bastian recently on the subject of electric heating, into which Mr. F. W. Goodenough and Mr. W. M. Mason threw themselves, and in which Mr. W. N. Goddard, of Windsor, has joined, in the columns of "The Times Engineering Supplement." Mr. Goddard tries hard to elucidate the position. But he adds to nobody's knowledge who is acquainted with the subject; and he adroitly leaves off his tale just where it would have been most interesting for the public, who do not care a straw about the relative efficiencies of appliances—their test of efficiency being the relative cost of performing a certain amount of useful work. Mr. Goddard admits that the B.Th.U. supplied for a given price by gas put the B.Th.U. supplied by electricity into a painful position in contrast. But he points with elation to the difference in the thermal efficiency between the gas-fire and the electric-radiator. Part of the B.Th.U. developed by the gas-fire passes away up the chimney, which he forgets to state is useful from the ventilating point of view. In the case of the electric-radiator, there is no such passing away of heat; and, therefore, great is the "efficiency" of the electric radiator. Plausible to the layman, but not to technical men. There is no 100 p.ct. efficiency in the electric radiator; and the heating effects of various types of such appliances differ very remarkably. The electric radiator cannot afford to let B.Th.U. go up the chimney; the gas-fire can afford this, as well as must.

The Final Test—Cost and Useful Value.

Mr. Goddard, however, does not stoop to such mendacity as to represent that the difference between the "efficiency" of gas-fires and electric heaters wipes out the difference between the wealth of B.Th.U. supplied by gas at a given price and the poverty of B.Th.U. supplied by electricity at the same price. But what he does say is that "as it appears to be an ordinance of Nature that electric heat can be applied efficiently and gas heat cannot be, electricity may be expected to compete in the near future as a still more formidable rival with gas." What does Mr. Goddard mean by the statement that gas heat cannot be applied efficiently? If Mr. Orme Bastian is a friend of his, he may whisper in his ear that he is treading on highly dangerous ground; for men with world-renowned names for scientific work in connection with heating have proved, by means more reliable than words, that the useful heating efficiency of modern types of gas-fires runs in the neighbourhood of 75 p.ct. This reminds us that Mr. Bastian, in opening this controversy, put himself above scientific tests the results of which have been confirmed time and again by different authorities. But he has never taken advantage of the suggestion we made to him on July 2 [p. 24] in these words: "If Mr. Bastian would, in the presence of a competent authority on behalf of the gas industry, like to make the physical and chemical tests which will broaden his knowledge somewhat, and enable him to correct his impressions as to gas-fires, perhaps an appointment can be made both in a laboratory and in the room of an ordinary house—providing the results arrived at are published." From that day to this, we have not heard from Mr. Orme Bastian on the subject. But after all what matters what the Bastians, the Goddards, or anyone else says? The householder has his own methods of deciding relative values and costs; and from the bumper experiences gas undertakings were having before the war as to the popularity of gas-fires, and as to the annoyance of many a householder who in cold weather had to avoid the room (if of decent size) in which an electric radiator was fixed owing to its heating inefficiency, it is safe to say that gas-fires have nothing at all to fear from electricity. If, too, the "Memoranda" in last week's issue are referred to, it will be seen that inefficiency in electric cooking operations has growing recognition, so much so that electrical writers are finding it difficult to maintain the subterfuge to which conditions have urged them to have recourse.

Ignorance Attempts to Lead the Ignorant.

The British Commercial Gas Association have much work to do, both educational and rebutting. They are doing it well; but the ignorance, prejudice, misunderstanding, and misconceptions regarding gas have an existence which cannot be dealt with in a day, and which call for persistent effort. Moreover, there are skilled people who are interested in keeping alive the ignorance, prejudice, misunderstanding, and misconception. They are assets to the electricity industry; and many electricians do not care a jot for the ethical aspect of the matter, so long as by these things their business grows. On the "Women's Page" in the "Daily Telegraph" last Saturday week, there was an article on "Fuel Economy—Hints to Housewives," from which it seems the one thing to be considered under the Fuel and Lighting Rationing Order is electricity. Gas, with all its demonstrable claims to be the cheaper and more efficient method of doing lighting and heating work in the household, is put into a very secondary place. Under fuel-rationing and shortness of labour, what is required in the household is the largest amount of heat at the lowest possible cost having regard to the facilities afforded by the heating agent for doing the work. These are the points for consideration; and electricity is out of it as a heat-giving agent in comparison with gas. Says the adviser of the housewife: "Meat cooked in an electric-oven saves 10 p.ct. in shrinkage, and less fat is wasted. Houses heated by gas or electricity are more easily kept clean—in itself a consideration in these days of scarcity of labour. An electric radiator, consuming two units per hour will heat a moderate sized room in twenty minutes or half-an-hour." We have frequently dealt with these points; and so criticism need not be repeated here as to the shrinkage of meat. The cost of continuously heating a moderate sized room at the present charge per unit by only 6840 B.Th.U. (two electrical units) delivered per hour would be enormous for anyone but millionaires; and the writer of the article evidently does not know when daring to write of fuel economy that the average expenditure of coal in the country for the production of two units of electricity is at least 7 lbs., or about 95,000 B.Th.U., without taking into account the distribution losses. This is ignorance attempting to lead the ignorant. Some very obvious means of reducing the consumption of electricity for lighting purposes are mentioned. A little further on the advice is given to a small householder that he should apply to his coal merchant for 2½ tons of coal and 1½ tons of coke, and take the balance of his ration in electricity. Why not gas? The writer proceeds to counsel the use of electricity for roasting and baking, for grilling and toasting, but fires (apparently coal fires, as gas is not alluded to) for boiling and soup making. This is the sort of "popular education" that is given by incompetent "masters."

"All-Electric" Kitchens, with Coke Suppplying the Bulk of the Heat.

Further testimony is supplied by the writer of "Cooking and Heating Notes" in the "Electrical Times" as to the inefficiency of electricity for kitchen work. We know how largely coke is employed to-day for water heating; and gas before the war was obtaining large adoption for hot-water circulating systems in houses, owing to its convenience and, with thermostatic control, moderate cost. Of course, with gas it is necessary for this purpose to ensure suitable conditions, and to have an efficient boiler. Given these, all is well, despite the fact that the writer of "Cooking and Heating Notes" in our contemporary clings (because it suits him to do so) to the ancient piece of fiction as to gas being a "very costly" medium for a domestic water-heating system. This hardly explains the popularity of the gas-heated water-circulators that had

vigorous growth before the war. However, our friend is not opposed to gas coke; and that is something, as it shows he is resigned to the inevitable. National kitchens are being fitted with water-heating arrangements for which coke is the fuel. He admits the uneconomy of water-heating by electricity, and that there is no cheaper method of heating water in bulk than in a coke-fired boiler, which is being adopted on an increasingly large scale—in public as well as other kitchens. He describes the compact coke-boiler that has been introduced by James Keith & Blackman Co., Ltd., in which 14 lbs. of broken coke, with house refuse, is sufficient to keep the fire going for twenty-four hours. One of these boilers has been established in the "All-Electric" National Kitchen in Earl's Court Road; and as it seems to do the bulk of the work there, "All-Electric" strikes us as being a misnomer. It furnishes water for baths and washing-up, for steamers, and for liquid heaters. These are the purposes requiring the major part of the heat. Hence the absurdity of "All-Electric."

Standardization of Lamp Voltages.

Standardization within limits means economy. In connection with electric appliances, it is often spoken about; but very little has been done. Electricity undertakings have been a power unto themselves in the matter of the selection of standard voltages which play a large controlling part in the standardization of appliances; and, moreover (though there are electrical scoffers at gas pressures, who write with very slender knowledge), the voltages are variable even in a single district according to the inconstant and dissimilar claims of neighbouring consumers. Thus consumers are not protected by the nominal standard of voltage. However, the Tungsten Lamp Association are tired of making lamps to meet the long range of voltages to which whim and fancy have given birth. This condition is not conducive to economical output; and it means bigger stocks for all dealers in the lamps, which, again, is not a good thing. Therefore, the Association have approved the standards advocated by the "B.E.A.M.A." and the British Engineering Standards Association—viz., 100, 110, and 115 (low voltages), and 200, 220, and 230 (high voltages). But as it would not be wise to jump all at once from the present range to these few varieties, it is proposed to move down slowly, and to make the first step to: Under 100 volts, 25, 50, and 55; low voltage, 100, 105, 110, 115, 120, and 125; and high voltage, 200, 210, 220, 230, 240, and 250. Lamps for intermediate and higher or lower voltages will be charged an extra price. But eventually it is intended to get down to the approved voltages first mentioned. In Continental practice, the number of voltages in regular demand is limited to one or two in both high and low voltage range; while in the United States and Canada there has been a movement the past four or five years to reduce the number of standard voltages to three. In connection with gas, the day will probably come when service-pipes will be generally governed, and high pressures maintained in the district canalization, so that householders, tradesmen, and manufacturers may always secure the pressure they desire despite large variations of neighbouring demand.

The "Omega" Tar and Pitch Burner.

In an article in which he describes its construction and working, Mr. E. Piernet states that during tests made at the Zurich Gas-Works with "Omega" burners for the heating of a large superheater, it was found that pitch could be substituted with great economy for the tarry oils that had been used previously for this purpose. Care must, however, be taken that the temperature of the compressed air used in the burners for pulverization is higher than the fusion temperature of the pitch. It was observed that melted pitch is fully as fluid and mobile as the tar at the temperatures at which it is ordinarily used for fuel. In addition to petrol and heavy oil fuels, "Omega" burners permit of the combustion of crude tar and soft pitch. The fuel reaches the combustion chamber in the form of one or more thin streams; its flow into the burner being regulated by a spindle-valve. The liquid, vapour, or compressed air which produces pulverization, on entering the burner, passes into a central tube and also into a ring-shaped space. The liquid fuel flows out in the form of cylindrical layers, separated by a partition; and the agent used for pulverizing or for forming the fuel spray is introduced into each of the fuel layers by orifices pierced obliquely in the walls of the burner. The burners are made in different forms [which are illustrated in the New York "Gas Age"] for working at low pressure or under fairly high pressure; and they can, it is stated, be used for heating boilers, gas-works retorts, locomotives, or steam-vessels. They allow of the utilization of sluggish fuels—such as tar and pitch represent—with a maximum of calorific power, and without danger of clogging. Some lengthy trials at the Geneva Gas-Works have shown the economy and freedom from accidents secured by the use of this type of fuel in the burners named. For heating the retorts in gas-works, the illuminating gas produced in the works can be used as a heating medium for the burners.

For the post of Assistant Gas Engineer to the Burnley Corporation, the Gas Committee have received 39 applications; and these will be considered at a special meeting on the 17th inst., when the number will probably be reduced, preparatory to the final selection.

NEW CAPITAL FOR GAS COMPANIES.

By HENRY JOHNSON,

Chairman of the Romford Gas and Coke Company, Ltd.

THE Financial Hardships Act is now a *fait accompli*, and the "standard" dividend is thereby fixed for the time being at 3 p.ct. for the great London Company, and at less than this for some other companies. Meantime, the Government are paying 5 p.ct. on War Loans; and the question arises, Why should money lent to the country be worth 5 p.ct. interest, while the Government themselves fix 3 p.ct. as a maximum for gas companies?

One need not enter again into the question of injustice to the gas companies, which has been sufficiently demonstrated. What the companies have to consider is the serious problem of raising new capital. Some companies have, by special permission, issued terminable bonds or stock, at 6 p.ct. interest; and these can only be paid off at the end of the term by raising fresh capital for the purpose. Thus we have the glaring contradiction that the Government agree to 6 p.ct. for new capital, temporary though it is; but the old capital is cut down to 3 p.ct. Many gas companies have powers to issue bonds with a maximum interest of 5 p.ct.; and a limit in amount of one-fourth or one-third of the paid-up share capital. But even where a proportion of such bonds may have remained unissued, it is now impossible to put them out, against 5 p.ct. War Loans. Where the bonds are issued up to their limit, the companies have no chance.

Many companies have in the past issued bonds at 4 p.ct. interest; but the market value of these is probably now about 65, and the holders have just reason for discontent. Would such holders be willing to subscribe for additional bonds at 5 p.ct. on condition that their present holdings were raised to 5 p.ct. interest on amounts equal to their new subscriptions, which presumably the companies would have the power to arrange under their Acts? Such a course might be an inducement to people to make a further investment; and if the authorities could be induced to forego the one-fourth or one-third limit, and so permit companies to increase their bond issue, instead of trying to issue shares or stock, the present situation might in this way be somewhat relieved until shares or stock can be issued at reasonable prices.

Again, if the Government are willing to pay 5 p.ct. interest on the money they borrow, is it too improbable that they might be willing to advance money to the companies at 5 p.c.t? The security is undeniable, being based on the statutory powers of the companies, and could take the form of bonds, shares, stock, or loans for a period. No doubt, such a course would need special arrangements, apparently within the power of the Board of Trade to recommend for the sanction of Parliament, if required.

The advantage to consumers is apparent, in the simple fact that, the cheaper the capital, the cheaper the gas. All kinds of work will cost more in the future; but to pay more for work and more for money is to pay twice over.

Any amount the Government might be called upon to advance could only be a few millions at the outside, and might be looked upon as some reward for the great work of the companies on behalf of the country during the war. If it be objected that this would be the beginning of nationalization or compulsory purchase on a depreciated capital value, the reply is that municipal gas-works are just as badly off now as the companies; and in no case has public ownership served the consumer better than the companies have done.

It might be said that the bankers are the proper ones to make loans to the companies. But, except for temporary overdrafts, there are many objections to the item "Loan from bankers" in a company's balance-sheet. As far as the writer's experience goes, banks are not keen to part with their money permanently for shares or bonds, nor even for long periods on the companies' security; and a loan which might be called in at any time would be a very inconvenient sort of item to have on one's mind, as some people who borrowed money to invest in War Loans have found out.

The Jones-Loughlin Steel Company, of Pittsburg, are to construct a 300-oven bye-product coke plant, with an annual carbonizing capacity of some 2 million tons. The plant will be equipped for the recovery of ammonia as sulphate, tar, benzol, and toluol, as pure products, principally for war uses.

Presentations to Mr. T. S. Lacey.—The September issue of the "Co-Partners' Magazine of the Gas Light and Coke Company" reports that a meeting was held at Beckton on Aug. 13, presided over by Mr. W. B. Leech, the Resident Engineer, to present to Mr. Lacey, the late Engineer, a silver tea service subscribed for by the workmen. Mr. Hart, representing the Works Committee, made the presentation, and spoke of the good feeling that had always existed between the men and Mr. Lacey during the long period of his connection with the Company—wishing him "many happy years in his retirement, and every comfort." Mr. Lacey, in responding, spoke of the help and comfort he had received from his wife, who had been with him at Beckton and was present that day. The meeting broke up after hearty cheers had been given for Mr. and Mrs. Lacey. Mr. Lacey, before leaving Beckton, was presented by the Engineer's staff with a recording barometer.

NORTH BRITISH ASSOCIATION OF GAS MANAGERS.

ANNUAL GENERAL MEETING IN GLASGOW.

THE Fifty-Seventh Annual General Meeting of the North British Association of Gas Managers was held last Friday, in the Hall of the Royal Philosophical Society, Bath Street, Glasgow. Mr. ROBERT MUIR, of Galston (the President), was in the chair; and upwards of a hundred members were present.

APOLOGIES FOR ABSENCE.

Apologies for absence were intimated from (among others) Messrs. W. Doig Gibb (London), R. G. Shadbolt (Grantham), J. W. Broadhead (Elland), Octavius Thomas (Pentre), George R. Hislop (Paisley), J. W. Napier (Alloa), C. Fairweather (Kilmarnock), and Alexander Yuill (Dundee).

COUNCIL'S ANNUAL REPORT.

[See "JOURNAL" for Aug. 27, p. 399.]

The PRESIDENT said the first business before the meeting was the consideration of the Council's annual report. He moved its adoption.

Mr. W. M. WILLIAMSON (Forres) thought they might have read to them the minutes of the special meeting held after the annual general meeting last year.

The HON. SECRETARY (Mr. P. B. Watson, Wishaw) said he supposed Mr. Williamson was referring to the meeting held in November, which was arranged by Mr. J. W. Napier, of Alloa. Unfortunately, he had no record of this meeting in the minute-book.

The PRESIDENT explained that Mr. Napier took charge of the proceedings at the meeting referred to.

Mr. WILLIAMSON asked if the meeting held in November was not a meeting of the members of the North British Association of Gas Managers.

The SECRETARY said it would not be regarded as a meeting under the auspices of the Association; otherwise he would have had a record of the proceedings in the minutes.

Mr. W. WILSON (Falkirk) pointed out that the meeting was one representative of all the Associations in Scotland, who were asked to meet together to deal with the question of the formation of a Scottish Gas Council. The meeting could not be described as one for which the North British Association was entirely responsible.

Mr. DAVID VASS (Perth) called attention to the change which had been effected in the presentation of the annual "Report of Proceedings." He was pleased with the change which had been made. He believed members would agree that it was an improvement to have the annual "Proceedings" published in book form. There was, however, one other matter which arose out of the annual report—namely, the Statistical Report. His view was that this report had outlived its day. For example, the Statistical Report that had been presented to them this year contained a very great many blanks. There were always a few; but on this occasion the omissions were exceptionally heavy. Frankly, he felt there was nothing embodied in these Statistical Reports which could be considered of material assistance to gas managers, and which could not be obtained from the annual statistical return published by one of the technical journals. The members would be well advised to consider whether the statistical statement appearing in the "Proceedings" ought not to be dropped. He quite appreciated the other change that the Council had made in connection with the publication of the "Proceedings;" but he did not think they had gone quite far enough.

Mr. LAWRENCE HISLOP (Uddingston) observed that if Mr. Vass was willing to put his suggestion in regard to the publication of the statistical statement in the form of an amendment, he would be disposed to second it.

Mr. VASS said he was quite willing to move a definite amendment on the point, provided the Council felt they had not the power to make the alteration themselves, and required authority from the meeting. His own feelings, however, was that the Council had power to make the suggested change on their own responsibility. Accordingly, he felt that the purpose he had in view would be served if the members gave expression to their opinions, so that the Council might have a guide.

Mr. LAWRENCE HISLOP remarked that it might be as well to continue the statistical statement for the current year, seeing that the Council had asked for the information.

Mr. W. WILSON: The information is already all in, with the exception of that from Perth. [Laughter.]

Mr. VASS explained that Perth could not give the data asked for. It was not possible for them to give an audited statement at this stage; and it was quite likely there were many other gas undertakings in the same position. Owing to conditions prevailing as the outcome of the war, it might be a month yet before Perth could supply an audited statement. Much the same reason could be given for the failure of Perth to furnish statistics for the report last year. There were, however, a great many blanks; and he did not consider that Perth's omission from the report was unusual.

Mr. ROBERT SIMPSON (Cambuslang) said he was prepared to move, if it were thought desirable, that the statistical part of the report should be continued. The information was very useful for directors and others connected with gas undertakings.

Mr. JAMES DICKSON (Johnstone) raised the point whether it might not be possible to cease publishing the list of honorary members, extraordinary members, and members' subscriptions. If this list were dropped, it seemed to him quite a feasible arrangement that the statistical statement could be included in the "Proceedings" now issued in book form. Instead of cutting out the report altogether, he thought the better plan would be to amplify the statistics, and bring them up to date.

Mr. LAWRENCE HISLOP remarked that, if these statistics were to be continued, he would like to make sure that they included data which was more useful. The information supplied by many members was often very vague; and not infrequently material was supplied which was not really asked for at all. In considering this question, it had to be borne in mind that the book was quite a profitable one for the Association, because the advertisements more than paid the cost of publication.

Mr. JAMES DICKSON said that, after the expression of opinion they had heard, he felt this matter might now safely be left to the Council. If by another year they could undertake to arrange for a more complete form of collation, this might perhaps induce Mr. Vass to withdraw his amendment.

Mr. VASS said he was prepared to abolish the Statistical Report, if it was found it could not be improved. He hoped the Council would give cognizance to the feeling of the meeting, which was that the preparation of the Statistical Report was not worth the trouble and labour involved, if the information got together was not to be of a more useful character. He would not, however, press the amendment.

AFFILIATION WITH THE INSTITUTION OF GAS ENGINEERS.

Mr. LAWRENCE HISLOP said there was one matter with respect to the affiliation fee to the Institution of Gas Engineers which he desired to raise. The phraseology used in the report of the Council did not make it quite clear what they had ultimately decided upon. Had they agreed to pay the additional fee for affiliation, or, if not, what was the line of action they proposed to take?

The PRESIDENT explained that the Council had decided to pay the increased affiliation fee for the present year; but what their attitude in the future would be, he could not say.

Mr. J. W. CARMICHAEL (Barrhead) remarked that in past years he had never been very much in favour of this affiliation to the Institution. Perhaps it might be explained what advantage (if any) the members of the Association obtained by the attendance of one representative at the Institution meetings in London. He was more concerned with the matter of benefit than the purely financial aspect of the question. At the same time, he desired to direct the attention of the members to thefact that they had now established in their midst a Scottish Gas Council, who were bound to deal with matters which previously they looked to the Institution to give guidance and information upon. Frankly, he did not see that there was any necessity for supporting two branches—the Scottish Gas Council and the Institution of Gas Engineers—both of which were working to the same end.

Mr. JOHN LANG (Alexandria) reminded the members that the cost of their representative going to London was a long way more than the affiliation fee. The expenses came to something like £35 for the Association's representative going to London; so it would readily be seen that the Institution did not gain anything so far as the affiliation fee was concerned. In a way, it was worth something to have a representative at these meetings in London, because he could report to the local Council any questions that seemed to him to affect the interests of the gas industry in Scotland. Last year the increased affiliation fee had to be paid, because the Association were still affiliated to the Institution; but it was for the members to decide whether in the future they desired to maintain this position.

Mr. G. BRAIDWOOD (Coatbridge) said that, in view of the explanation made by Mr. Lang, he was prepared to move that the Association should continue in affiliation with the Institution.

Mr. W. WILSON said he had the feeling that it would rather be maintaining the reputation of Scotsmen for being somewhat sparing, if they refused to continue in affiliation because of the increased fee. Accordingly, he would second Mr. Braidwood's motion.

Mr. LAWRENCE HISLOP thought the only motion that was competent at the present stage would be one that the Association should withdraw from affiliation with the Institution. In his opinion, it was unnecessary to propose a motion that they should remain affiliated when, as a fact, this was the actual position at the present moment.

The PRESIDENT asked Mr. Carmichael if he was prepared to move that the Association should withdraw from affiliation.

Mr. CARMICHAEL said he did not wish to put forward any motion at all. He had merely pointed out that the Scottish Gas Council intended co-operating with the National Gas Council, and that the latter body was in reality the Institution of Gas Engineers.

Mr. LANG said he felt it was most advisable that the Association should retain its affiliation with the Institution. There was no disguising the fact that matters were cropping-up at the present time concerning which the members ought to have the fullest knowledge. Besides, the Scottish Gas Council was only as yet feeling its way; and until it was established, the Association ought to continue as now, and so have access to the most authoritative sources of information.

It was unanimously agreed to continue affiliated to the Institution.

Mr. JAMES DICKSON (Johnstone) said that, arising out of the matter which had just been discussed, he wondered if it would not be worth while for the Council to consider the expediency of making an alteration in the method of appointing their representative to the Institution. He had the notion that it might be a more practicable arrangement if the President for each year should be the officially recognized representative. This was a more sensible way than electing the President to the position the year after he held office.

The PRESIDENT agreed, and said it was only a matter of arrangement. The idea expressed by Mr. Dickson could very easily be given effect to.

THE OFFICIAL ANALYST.

Mr. W. WILSON said there was one other matter referred to in the report to which he would like to allude. The Association had now an official Analyst of their own; and it was quite gratifying to observe the number of samples which had during the past year been sent to Mr. Gemmell for analysis. He found the services of Mr. Gemmell of very considerable financial benefit. Though he had one of the best

laboratories in Scotland—and staff as well—instances had arisen on two occasions during the year when an independent analysis became necessary. Disputes had arisen regarding the quality of sulphate of ammonia; and in these days when an extra 3s. 3d. was to be obtained for sulphate above a stipulated percentage, it was well worth while for those dealing in the product to safeguard themselves, when requisite, by an independent analysis. Further, he had caused samples of coke and breeze to be tested independently by Mr. Gemmell; and he had been delighted with the services rendered. Members ought to avail themselves more of the services of Mr. Gemmell, and give him additional work to perform.

A FALLING MEMBERSHIP.

Mr. W. M. WILLIAMSON (Forres) alluded to the fact that in the course of nine years the membership of the Association had dropped by 23. Could not, he asked, something be done to bring the number to something like its old level?

The PRESIDENT explained that the point raised by Mr. Williamson had not been lost sight of by the Council. They had done their best to increase the membership; and this year there was quite a substantial increase.

THE REPORT ADOPTED.

The adoption of the report was at this stage seconded by Mr. J. BELL (Dumbarton), and agreed to unanimously.

MANAGERS AND THEIR SALARIES.

The PRESIDENT announced that a Sub-Committee of the Council had been appointed to go into the question of salaries and other payments to gas managers. It was the feeling of the Council that the time had now arrived when something ought to be done in the matter of salaries. As yet no meetings of the Sub-Committee had been held; but arrangements were being made for one very shortly.

This announcement was received with applause.

ERASIONS FROM BALLOT PAPER.

Mr. W. WILSON said he had been asked to apologize for a slight mistake which had occurred in the ballot paper. It would have been observed that the names of two gentlemen had been erased. It was quite true that the gentlemen referred to had been duly nominated and accepted by the Council as members of the Association; but, strictly speaking, they did not become full members until such nomination had been finally approved of by the annual meeting of the Association. It was only at the eleventh hour that the irregularity or inadvertence was detected; and then it became necessary to convene a special emergency meeting to deal with the matter. The position was that the nominations of these two gentlemen as office-bearers was, strictly speaking, not altogether in order. He hoped these gentlemen would not regard the erasion of their names from the ballot paper as any slight upon them.

Mr. J. RICHMOND (Penicuick) said he did not regard the erasion of his name as any slight whatever. He had, however, to point out that he had been duly nominated for membership last year; and the singular thing about it all was that he had paid two annual subscriptions. It was the payment of the two annual subscriptions that he could not altogether understand—particularly as it was only this year that his name appeared as a new member.

The subject was here allowed to drop.

The PRESIDENT then delivered the following

INAUGURAL ADDRESS.

My first duty is to thank the members for the honour they have conferred upon me in electing me to the office of President. I am sensible of the responsibilities of office, particularly when I note the names of my predecessors. I shall endeavour to give of my best in carrying out the duties; and I appreciate very highly the many kindnesses shown me during my year of office.

A TRIBUTE TO THE MEMORY OF WILLIAM YOUNG.

After an interval of four years, we are to-day celebrating the memory of William Young by having a lecture by Prof. Cobb, of the Leeds University. Whatever good work the Association is capable of doing, I may be permitted to say that this memorial lecture is one of the best evidences the Association has in being able to attract men of high scientific attainment and of putting on record in the "Transactions" the latest results of research in some special department of work in the industry. If it is to continue in useful work, the Association must be made active in bringing out the talent of its members. Members themselves should recognize that this is a society for the spreading of useful knowledge among themselves.

The Association, with its growth in numbers of young men, and with fresh minds on new subjects, should be the medium by which a greater number of contributions could, and ought to be, made. The suggestion occurred to me that if instead of one meeting in the year, half-yearly meetings were held, and short contributions invited, really useful work would be done in the name of the Association. This idea, however, appears difficult to carry out in practice. The reason is probably that the excellence of our Technical Press provides an all-sufficient outlet for what is worthy of notice. Reference to such a renowned scientist as William Young reminds one that many of his theories put forward more than thirty years ago as regards carbonization of coal are to-day visible in practice. So much is this recognized to be the case that the Council recently considered the question of reprinting in book form some of the earlier papers contributed to the Association by Mr. Young.

MOVING WITH THE TIMES.

The gas-works under my charge are comparatively small ones—having only a 17 million cubic feet output. In a small works details and the importance of small things loom large, demanding very close attention and much time to be spent on the part of the manager. Nevertheless, from my quiet place of local interests I can look upon the outer world with a degree of interest and a satisfying knowledge of the importance of the gas industry. I am able to survey the position as from a distance, and to note the trend of affairs, the changing improvements, and the growing importance of gas supply in domestic and industrial life. Progress may be said to make for success. But the best of us are slow in our movements; and we only act under the power of compulsion. Scotland, with its rich flat-flame cannel coal gas is now only a memory, and to-day we can congratulate ourselves in being astride, as it were, the latest and up-to-date ideas. The old parochial manner and method have gone. The common interests of the industry demand that even individual and corporate interests must sink, and that the policy of the gas industry must be for the national interests. The management of its affairs must be carried out with statesmanlike order.

The gas required to-day is essentially a heating gas. The economy so sternly demanded all round has brought this about, and the gas manufacturer and the gas consumer of to-day are fitting better than ever into each other's interests. At the same time, it must not be overlooked that the industry is too much built-up on the unit basis. It has yet to undergo a radical change as regards ridding itself of penalties and conditions, which, if allowed to remain, would make progress impossible. What has impressed itself on my mind is that for some time past the electrical industry has been preparing for a great effort to effect economies and to centralize its interests.

A great deal has been written as to the possibilities and value of a cheap supply of electricity for power. This is readily admitted. What is not quite so satisfactory is as to what efforts, if any, the gas industry is making in the same direction. I have said that national interests must come first. Coal is the basis material for the production of a vast amount of the industrial wealth of this country. We are fortunately rich in the possession of much of this valuable material. But everything must depend upon the methods of its use; and the industry that can make use of coal to the most valuable extent is, I venture to believe, the gas industry. If there is to be economy in the use of coal, this can only be got by first not destroying it in itself, but by employing methods of obtaining the largest number of valuable products therefrom, which will, in turn, confer the greatest financial and practical benefits to all concerned. I am not prepared to pursue this line of thought; but I am willing to leave the possibilities to be dealt with by those having authority and knowledge. I am satisfied that the policy to be followed for the national prosperity will make use of the gas industry as the best means to this end.

IMPROVEMENTS AT THE GALSTON GAS-WORKS.

I shall endeavour to give you some account of the gas-works at Galston under my management. The works can claim favourable comparison with any works of the same size; and the work of improvement and progress has been achieved after a twenty-six years' connection. I took over the duties of manager in 1892. At that time the plant was in a very dilapidated condition, while financially the Company was almost bankrupt. Alterations were absolutely necessary; and a short survey of the work accomplished will, I trust, prove interesting. The carbonizing plant demanded my attention in the first place; the working results being so very poor that a considerable percentage of gas was lost through leakage from the retorts. The retorts were grouped in two settings of three and one setting of a single retort. The bench was rebuilt, and three settings of four retorts each were installed; the ovens being made quite large enough to hold an additional retort. The retort-house was entirely rebuilt, and was planned to have the coal-store closely adjoining.

As evidence of the age of the plant, the old hydraulic main which was put up in 1843, when the works were first started, was made of cast iron, and suspended on the front of the bench. An exhauster with steam-engine, purchased second-hand, was next installed. Also a brush scrubber to deal with 150,000 c.ft. per day. The additions to the plant necessitated new buildings; and the material was found in the stonework which had formed the tank of one of the original gasholders. The system of purification by lime was in practice. This was almost unavoidable, owing to the small size of purifiers in use. A second-hand set of four purifiers, fortunately in good condition, was next erected, and the use of oxide was commenced. This particular improvement, with most ample area in the purifier boxes, yielded most satisfactory working results. The buildings in this case were of stone; the material being obtained from another disused gasholder tank.

Gasholder storage next demanded attention; and the decision to erect a much larger holder was justified by the satisfactory increase in gas output. The tank, built of stone, of the existing holder, became cracked, due to underground colliery workings. The new holder erected was of a capacity of 80,000 c.ft., having a steel tank.

A small vertical steam-boiler was next replaced by a Cornish boiler. Let me state that, from my experience, where the steam-boiler is found inadequate, especially with a boiler of the vertical type, it means a large expense for fuel as well as a very great deal of personal attention. I do not recommend a vertical boiler for gas-works where coke breeze is available, as, owing to the small water and steam space, the cost of working will be high.

Having reached the stage when the plant at the works was ample and in good order, it was now time to look around for new consumers. These were found in several rows of miners' houses just outside the town. The houses were piped and fittings supplied by the Gas Company, with slot meters set at an extra charge of 3d. per 1000 c.ft. This extension I never regretted carrying out, as it increased the gas sales very considerably. The number of cooking appliances in use is 1400—boiler rings supplied and fixed free, and cookers on hire-purchase.

WATER GAS BY STEAMING IN HORIZONTALS.

Lately I have been making water gas; and the process has been so successful that a short explanation may prove an encouragement to others who may have hesitated to bring it into use with horizontals. The method I adopt is to enter a ¾-in. pipe with holes on both sides, 8 in. apart, along the floor of the retort. The best results are obtained by two hours' steaming after a six-hour charge of coal is exhausted. It is desirable that as heavy a charge of coal as possible should be put into the retort, in order to provide a good depth of coke in it. The yield of gas per ton of coal is now about 12,000 c.ft., and 13,000 c.ft. has been reached. The quality of the gas from the coal used can stand considerable reduction; and care has to be taken that the amount of water gas introduced is not overdone. From the point of view of saving of coal, and being able to supply to consumers a satisfactory quality of gas, I can heartily recommend the process.

While the method I have pursued is that of introducing a steam-pipe into the retorts at the interval when the charge of coal has been exhausted, for the larger works the process can be carried out somewhat more satisfactorily in another way. Incidentally, it ought to have been stated that carbon deposits in the retorts, always a source of annoyance and loss, completely disappear after a time. For larger works with horizontal retorts, where there are from (say) fifty retorts upwards working, the use of the steam-pipe inside the retort might lead to irregularity in the production of water gas, due to the extra work and attention needed, especially in these times of uncertainty of labour. An outside producer of brickwork, with the usual fittings, coke-feeder hopper, and clinkering door, &c., built on simple lines and placed in a convenient position separate from the bench, will prove an invaluable help to increased gas production. This arrangement provides a regular flow of producer gas for mixing with the coal gas in the foul main or the hydraulic main. It will also be under thorough control as regards increasing or decreasing at will the percentage amount of producer gas to be made.

COAL CONSERVATION.

Of late, perhaps, no subject has given rise to so much controversy as the Order of the Coal Controller, in view of national needs, to reduce the use of fuel for household purposes. With the necessities of the situation there is, and must be, entire agreement. In keeping, however, with legislation affecting the individual, and no matter of what kind, opinions and judgments are found to seriously differ as to the procedure to be followed that will be fair and equitable, and at the same time attain the end desired. It may be stated that where a number of individuals are concerned, fairness and equity all round are not possible. There must be a certain amount of toleration, of suffering, and of loss. Where national need must be met by national effort, and economy is the watchword, nothing matters but that the end sought should be attained. To succeed is to maintain our supremacy; and that will be part of the great victory. In my view, the true economies of the use of coal, domestically and industrially, determine the best lines for a scheme of this kind.

There is an overflowing amount of evidence that the method of using coal in gas-works needed for the supply of gas to the public meets most fully this requirement. There is no need for me to provide data—proof of this kind is familiar to most of us. For the direct carrying on of the war, gas-works products are a prime necessity—for the needs of many manufacturing processes vital to the times, and for the demands of agriculture in the important matter of food supply. A ton of coal carbonized in a retort, with its yield of gas, coke, tar, ammonia, benzol, toluol, &c., is of considerably more value than a ton of coal used in the domestic grate or the steam-boiler. These simple facts need repeating; and the public at large would do well to listen and to give practical heed to them. The Order, as framed, has attached to it the strong suspicion that it will give encouragement, in some measure at least, to the use of raw coal instead of the consumption of gas. It is my belief that the Order so far as the ration of gas is concerned, and having regard to the obligation undertaken by the Coal Controller to the Ministry of Munitions, is "a leap in the dark." When the actual evidence comes to light after a few months' experience, it will probably be found that the allowance for gas will be increased, and that favour will be shown to gas-works in giving an ample supply of coal.

POINTS IN THE NEW FUEL ORDER.

I may very shortly refer to one or two apparent defects in the working of the Order. My own locality is a mining district; and it is understood that miners will not be bound by the scale of fuel allowance. With this in view, other households, the men of which are also engaged in national work, will require to be satisfied with not more than 4 tons of coal per annum compared with a quantity of 6 to 8 tons for their neighbour who happens to be a miner. I have nothing to say against the miner—he deserves well because of his hazardous calling. The man who is a munition worker, engaged (say) on outside employment, needs for his comfort just about as much coal as the miner; but he must do with one-half less. This arrangement can hardly be looked upon as a fair one; and I mention it as an extreme case, and as an instance where there is a chance of a breakdown of the Order resulting. It must be remembered that people will starve for the want of fuel as well as from the want of food.

As to the effect of the Order on the output of gas, it is believed that in many cases this will not be seriously affected, and in the smaller towns, where gas has a more limited use, no restriction in gas consumption is likely to result. In many of our industrial towns, however, I believe the effect of the Order will be to seriously reduce the output of gas. I am led to this belief from the evidence of data furnished me showing the consumption of gas by slot-meter consumers in certain towns. There are areas where, with a low price of gas and every facility given for its use for cooking, &c., the annual consumption of gas per consumer is unusually high.

From returns received from a number of gas-works, the consumption of gas in two-room and three-room houses is shown to be from 40,000 c.ft. to as high as 80,000 c.ft. per annum. These were slot-meter consumers of the industrial class, and they formed a good percentage of the total number of consumers in the area. Gas consumers in thousands of cases are munition workers; and if their fuel supply (coal or gas) fails, they will not be silent in letting their position be known. A particular household is to be given (say) 4 tons of coal in the year. If it is assumed that they convert one of the tons of coal into gas, 15,000 c.ft., along with 9000 c.ft. for lighting, will be available. This result will mean that only 3 tons of solid fuel will be free for use in the conditions of our cold northern climate; and this amount is less by half of what was formerly used. The gas consumption will also be reduced by about one-half; and when it is noted that, as regards the gas undertakings concerned, a large proportion of their consumers are of the slot-meter class, it will at once be seen that a serious reduction in gas consumption will result.

This decreased output of gas from gas-works will be contrary to the good intentions of the Order; and, coupled with the hardships to the people, it is difficult to see how the Order can hope to survive its hard-and-fast rules as shown in the scale of fuel consumption. It ought to be stated, however, that in those towns where there is a plentiful supply of gas available, a larger ration of gas will most probably be allowed. This concession will be welcomed, particularly in households where gas-fires have been installed. It will also furnish evidence that the scheme is a flexible one; and it will be satisfactory to the gas industry if works able to give an ample supply of gas are allowed to do so.

In concluding my reference to this subject, it should not be overlooked that there are certain gas-works—I refer particularly to works having vertical retorts—where the economy in the use of coal has reached a high state of perfection. In a few cases that have come under my observation, the quantity of coal now being used for the manufacture of a given quantity of gas has been reduced by from 40 to 50 p.ct. Here, indeed, is realistic evidence of what can be accomplished in saving coal; and gas-works in this position may consider themselves deserving of some preferential treatment in supplies of coal.

The shortage of coal supply is a matter of great concern to many gas-works at the present time. It is not, however, the circumstances of the present moment that cause the greatest anxiety, but the prospect of a real scarcity of coal for the coming winter. We are aware of the two main causes of this shortage—namely, the needs of allied countries, and the lessened output due to the taking of men from the pits for army requirements. That there was urgent need for the situation being met by immediate action was seen in the notice recently issued from the Coal Controller's Department. The Government have recognized that the present situation demands that men of low medical category should be freely released from the army in order to return to the mines. It is hoped that the effect of this effort will not be too late. A belief has been present in the mind of many of us that the situation has not been sufficiently realized, or it would have been grappled with at a much earlier stage. So far as gas-works are concerned, the Department of the Coal Controller cannot plead ignorance, as weekly returns of stocks of coal have been furnished for many months past. I am enabled to give information as to the actual position of stocks of coal in gas-works in Scotland.

COAL STOCKS IN SCOTTISH GAS-WORKS.

Taking the returns of stocks at 122 gas-works as at October, 1917, and at the end of July this year, the quantities were:

October, 1917	305,494 tons.
July, 1918	129,141 ,,
Reduction of stocks	176,353 tons.

The stocks of coal at gas-works at this time therefore are less than half what they were in October, 1917, or a reduction equal to 58 p.ct.

The danger of a failure of the gas supply in many towns during the coming winter is not without prospect. This will inevitably happen unless the present low stocks of coal are greatly increased in amount. In a number of works existing stocks are equal to less than one week's maximum requirements. I learn that the Coal Supplies Committee have the matter well in hand, and that they are fully aware of the position. They are hopeful that from now onwards additional supplies will be forthcoming. In the same

connection it is to be hoped that the suggestion for the temporary suspension of the Eight Hours Act will meet with the favour of the Government, and that the miners will loyally answer to the situation. Of this, however, it will be well not to be in the least optimistic, as action of this kind would be sure to create unrest in some quarters at least. Coal is an essential requirement; and gas production and supply is a key industry. With the proposed rationing scheme for industrial works, it will surely not be a vain hope to expect that gas-works will have preferential treatment over other less essential industries.

SCOTLAND AND THE FINANCIAL HARDSHIPS BILL.

The Statutory Undertakings (Temporary Increase of Charges) Bill, so far as Scotland is concerned, is of practical interest to only four gas undertakings that are statutory, being company concerns. The small number of companies having Private Acts is explained by several reasons. In the first place, many of the gas-works are under the Burghs Gas Supply (Scotland) Act, 1876, and in these cases maximum price is not in force. This is the case also as regards the larger undertakings under municipal control. Again, many of the gas-works under company control are of small or medium size, and are so situated as to have their own area of supply pretty well determined according to their own ideas of extension. They do not border on any neighbouring companies' area, so that there has not been any real need for protection. In Scotland, therefore, gas-works have, with only a very few exceptions, not felt the financial hardships due to sliding-scale arrangements that have been experienced in England in the cases of a large number of undertakings. This whole matter shows an anomaly having disastrous results in the one case, and leaving a kind of favour in the other—the company giving a public supply of gas under its Special Act was prevented from meeting its obligations to its shareholders, while the gas consumers benefit from a lower price of gas than they are justly entitled to. On the other hand, the private company, in many cases, is able to continue its pre-war dividend, and the consumers are paying extra rates for gas equal to the additional costs of working. Simply stated, the company that is under statutory obligation is being crippled as a unit of an important industry, and progress in finding new capital and extending the business is made difficult.

THE QUESTION OF SUBSCRIPTIONS.

In the matter of members' subscriptions, the sum has recently been increased because of increased costs in carrying on the business of the Association. The Council have again had the subject of subscription under consideration, and the opinion was expressed that the subscription for membership should, in every instance, be met by the company or corporation represented. It is known that there are cases where the manager himself pays the subscription. The suggestion is made that, in sending out the notice for payment of the subscription, this should be in the form of an account rendered to the undertaking concerned. This arrangement will, doubtless, meet with the approval of all members. It will also put forward that the subscription might be still further increased, and should be one definite sum—the scale for different sized works being adhered to. A certain amount of the subscription would be allocated to each of the funds. The advantage of this arrangement will be that the Research Fund, for example, instead of being wholly dependent upon the free offering of only a few members, would be credited with a definite sum from each member. This, it is felt, is what ought to be, and should result in strengthening each of the funds, according to requirements.

MR. GEORGE R. HISLOP.

As President, I feel it to be my duty to make reference to a matter of some personal interest to the Association. I refer to the recent retirement of Mr. George R. Hislop, of Paisley, the veteran of the gas profession in Scotland. With a record of fully sixty years in gas-works management, his position is without rival. We have all admired his mental activities, still alert; and it is a very happy circumstance that, while his years are more than four score, his physical powers remain strong, and almost youthful. Three times President of the Association—in 1869, 1875, and 1889—his connection with the industry may be said to be both ancient and modern. He has done good service to the industry by sheer hard work and inventive ability; and I particularly wish to say his personality has always been of the highest standard and an honour and example to our profession. To be worthy of a good name is the highest honour a man can give to himself; and of Mr. Hislop this can be fully endorsed. In the name of the Association, I desire to convey to Mr. Hislop an expression of our feelings of profound respect, and to express the hope that the years of his retirement will be many, and will give to him a time of restful enjoyment.

CONCLUSION.

The last words of this address must be in the form of a simple prayer—that the world conflict at arms between the civilized races will soon end with victory to our righteous cause, and that the sorrow and pity of the horrors of war will never again be possible.

Mr. W. WILSON proposed a cordial vote of thanks to Mr. Muir for occupying the presidential chair, and for the able address he had delivered. They had listened to a most thoughtful and interesting address; and its value was enhanced because of the fact that it had been delivered by a gentleman who came from one of the remote parts of Scotland—a district which had very seldom been honoured in having one of its representatives as President of the Association.

The PRESIDENT, in acknowledging the vote, remarked that he had given them of his best in the address.

The William Young Memorial Lecture.

Mr. JOHN W. COBB (Livesey Professor of Coal Gas and Fuel Industries in the University of Leeds) next delivered the William Young Memorial Lecture, his subject being "Carbonization Reactions." [This will be found on pp. 482-87.]

Mr. JAMES DICKSON said he had been deputed to propose a vote of thanks to Prof. Cobb for the able and delightful way in which he had presented his subject to the meeting. He was sure they would agree that the lecturer had quite come up to their expectations regarding him, and had fully maintained the high standard set by those who had occupied a similar position at previous meetings of the Association. If this was Prof. Cobb's first lecture in Scotland, then he could assure him that the gas engineers of Scotland would only be too pleased to have him among them again, and to hear him address them on any subject he cared to take.

The PRESIDENT said he would like Prof. Cobb to accept nomination as an honorary member of the Association.

Prof. COBB (who was very heartily applauded) said he could not allow the kind proposal of the President to pass unacknowledged; and he would gladly acccept the privilege of becoming an honorary member of the Association. It was quite true that he had never previously addressed a meeting of Scottish Gas Managers; and this much he would also say—that he had never before addressed an audience that seemed to him to have given closer attention to his address than they had done.

ELECTION OF OFFICE-BEARERS.

The SECRETARY announced that, as a result of the ballot, the following office-bearers had been elected:

President.—Mr. William Wilson, of Falkirk.
Vice-President.—Mr. James Dickson, of Johnstone.
Members of Council.—Messrs. George Braidwood, of Coatbridge, and David Fulton, of Helensburgh.
Auditors.—Messrs. Spalding and Muir, C.A., of Glasgow.

A vote of thanks was passed to the Scrutineers for their services in connection with the ballot.

NEXT PLACE OF MEETING.

On the motion of Mr. WILSON, it was agreed that Edinburgh should be the *venue* of the next annual meeting.

PRESENTATION TO THE PRESIDENT.

Mr. JOHN LANG said it was the custom for the retiring President to be presented with the Association's gold badge, as a memento of his year of office. In asking Mr. Muir's acceptance of this, they had to express their indebtedness to him for the services he had rendered. He had carried through his duties with honour and credit. At one time it was feared that they might be deprived of Mr. Muir's presence at the meeting; but although suffering some inconvenience, he had pluckily stuck to his post. They hoped that he would soon have fully recovered, and be long spared to wear the badge.

The PRESIDENT remarked that the gift would be one of his most prized treasures.

Mr. WILSON having thanked the members for electing him President, the proceedings terminated.

A Large Gas Blowing Engine.

The Sept. 6 issue of the "Engineer" contains, as a two-page supplement, a series of line engravings illustrating a 1500 H.P. vertical gas-engine and blower, recently built by the National Gas Engine Company, Ltd., of Ashton-under-Lyne. The engine is of the six-crank vertical tandem type of the makers' standard design, and is rated to develop 1000 B.H.P. on continuous load at 200 revolutions, working on blast-furnace gas of a calorific value of 90 to 100 B.Th.U. per cubic foot. A special gear-device is fitted to enable the speed to be reduced to as low as 120 revolutions. The load can be increased by 10 to 20 p.ct. for short periods without overheating. The blower has four double-acting cylinders, and is coupled direct to the engine through a short intermediate shaft and flexible coupling. The tested capacity of the blower is 24,000 c.ft. of free air per minute, against a pressure of 12 lbs. per sq. in. A reduced volume of air can be delivered against a pressure of 15 to 16 lbs.

The War and Lighting.—In a discourse at the Scientific Products Exhibition, Mr. Leon Gaster stated that at the outbreak of war this country was unduly dependent upon imports from the Continent in respect of illuminating appliances. The annual value of imported incandescent gas-mantles was estimated at £100,000,000, and of electric lamps at about £25,000,000. This position was gradually being remedied, as it should be in a country that had always been first in the study and practice of artificial illumination. With the present rationing scheme of illumination, no hardship would result if the light available was wisely used and directed. Light on the object to be seen, and not on the eyes, was the main point to be considered; and a little less foolish economy on proper shades for lights was greatly to be desired in the public interest. When the war started, the street lighting of London was so varied that it was possible for an airman to identify any particular district by its lighting. This was rectified by making the standard of lighting uniform. Darkened streets caused more casualties than raids; and so uniformity was the thing now aimed at, and not darkness.

WILLIAM YOUNG MEMORIAL LECTURE TO THE NORTH BRITISH ASSOCIATION OF GAS MANAGERS.

By JOHN W. COBB, Livesey Professor of Coal Gas and Fuel Industries in the University of Leeds.

CARBONIZATION REACTIONS.

Mr. President and Gentlemen,—William Young, in whose memory this lectureship was founded, was pre-eminently a successful gas engineer, and therefore essentially a practical man. But being born north of the Tweed, he claimed his national birthright and was also a philosopher. Faced with the tangle of problems which the process of carbonization presents to any enquirer, he refused to be a pure empiricist and collector of results, and insisted upon constructing for himself, as he went along, working theories which should clear his own mind as to the meaning of what he had observed, and point the way to future action. In this he was courageous, wise, and effective. If any one of us concerned with similar problems is invited to lay before you the results of his own work, or the conclusions he may have drawn from the work of others, the invitation is in itself a distinction; and I appreciate it highly—particularly because the professorship I hold at the University of Leeds was endowed as a memorial to another very distinguished gas engineer, Sir George Livesey, and because this is my first opportunity of speaking to an audience of gas engineers in Scotland.

The process of carbonization has many aspects, and one thing which has tended to prevent those occupied with it in daily life from arriving at a comprehensive understanding of the phenomena involved, has been that attention has for various reasons been centred on one particular product—gas for the gas engineer, coke for the coke-oven manager; and I think it will be admitted that one factor which determined the gradual expansion of William Young's broad outlook and scientific spirit was his somewhat unusual association with the two industries of public gas supply and shale distillation, which called for an appreciation of all-round values and an acquaintance with different methods of realizing them. This broader outlook is now no longer to be merely admired as the rare endowment of an exceptional man, but to be insisted upon in the mental equipment of every gas engineer who is to do his industry full justice, and face those problems in the scientific utilization of fuel which now more than ever press for solution.

In taking up a complex study such as that of the reactions occurring during the carbonization of coal, there seem to be two main roads to follow. One may take the original substance in all its complexity, carbonize it under various conditions, and, by the careful consideration of exactly recorded results, attempt to arrive at general conclusions, the validity of which can be determined by further observation, or by modifying practice in the direction indicated. This method is followed more or less by every good gas engineer, and is what one understands by intelligent and progressive works' practice. Alternatively, one may try to arrive at a better understanding of the highly complex by a preliminary study of the simple—determining, for instance, the mode of formation and decomposition of some one constituent of coal gas under a variety of conditions, including, of course, as of primary importance, the conditions to which it will be subjected in carbonizing practice. This is particularly a method for the laboratory; and when one considers the number of substances involved in a survey of carbonization on such a plan, it is plain that the amount of work waiting to be done is enormous, and leaves plenty of room for judicious discrimination between the more and the less important.

In connection with the first method of investigation noticed, there may be some temptation to believe at first sight that so much coal has been carbonized under so many conditions in the past that data must already be to hand for the solution of all the principal elementary problems. This is not so. Carbonization necessarily consists in raising coal from air temperature, with consequent decomposition. It is obvious that, in order to trace exactly what happens in the process, coal should be heated slowly, and the decomposition at each temperature should be completed or practically completed before the temperature is further raised. This cannot be done in ordinary practice, for commercial and other reasons. The process of carbonization so conducted would probably require weeks for its completion. The ordinary works' practice rushes through all the lower temperature stages, and the products of distillation which have been secured in these stages are subjected to drastic treatment at higher temperatures before they can be separated and investigated in the laboratory.

It is possible, however, to slow-down the operation of carbonization to any desired extent—raising the temperature with extreme slowness, and collecting the products. This has been done in the laboratory by Burgess and Wheeler[1] in this country, and by Pictet and Bouvier[2] in France. The results obtained are useful and interesting, but incomplete. The incompleteness arises from a necessary limitation which attaches to all such laboratory experiments, as the quantity of coal which can be handled is not sufficient to allow of a thorough quantitative examination of the products. This is readily comprehensible when one remembers that the yield of tar from coal may be taken as of the order of 5 p.ct., and the toluene in the tar as less than 1 p.ct., which means 0·05 p.ct. of the weight of coal. It is plain that, for the solution of this particular problem, a larger scale of apparatus is necessary —something in the nature of a small gas plant, designed primarily to allow of the most effective control of temperature and every other determining condition. What I would emphasize now (as bearing directly upon the question of how much research is waiting to be done) is that the investigation which I have just outlined is of obvious and fundamental importance, but that it has never been carried out, although plans have been made for commencing it as soon as the times allow.

The second method of investigation to which I referred—the study of the decomposition of single constituents—is one which I have applied recently in collaboration with Dr. S. F. Dufton to two constituents of coal gas which have assumed dominating importance. I refer to benzene and toluene. In working on a process for the production of the latter from other constituents of coal tar, I could find no published information on the decomposition of benzene and toluene of the precise character necessary for useful technical application. Accordingly we set to work—starting with benzene—to find out where and how these substances decomposed under the action of heat, but bearing in mind the special conditions attaching to the carbonization process.

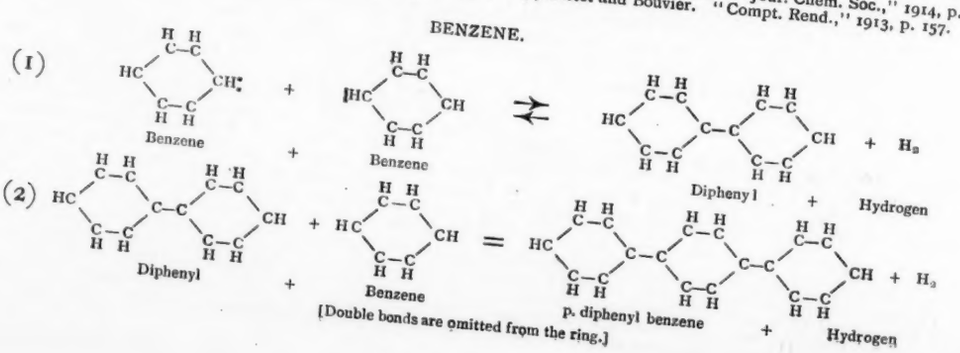
BENZENE.

For this purpose we passed benzene vapour through a silica tube which contained a 5-in. column of red-hot coke maintained at the desired temperature; and the rate at which the benzene passed was so adjusted that its time of contact with the red-hot coke was of the same order as would occur in carbonizing practice—some ten to fifteen seconds. The benzene was not simply boiled through the tube, but was first vaporized in a "carburetting" flask by bubbling gas through it. The gas used was nitrogen when we wished it to be inactive, but a potentially active gas (usually hydrogen) was employed when we wished to determine its influence on the reaction. By raising the temperature of the carburettor, the richness of the gas stream in benzene could be varied at will. Thus, saturating at air temperature (15° C.) the percentage of benzene present by volume would be 8; while at 50° C. the percentage would be 36. The stream of gas, after passing through the coke, came away to a flask which was simply air-cooled or immersed in ice and salt; and there easily condensible products were deposited. It then passed through a second condenser cooled by solid CO_2 or liquid air to complete condensation, and the remaining gas was collected. measured, and analyzed.

We first determined that, in a stream of nitrogen rich in benzene, decomposition had just started at a temperature of 550° C.—a dull red. The benzene then passing the tube deposited a small quantity of a solid resembling naphthalene in appearance. It was identified as diphenyl, and was produced in greater quantities along with hydrogen gas as the temperature rose. The decomposition indicated was a molecular condensation of the one-ring compound benzene to a two-ring compound diphenyl, eliminating hydrogen, and in the material deposited at higher temperatures, we found a three-ring compound, diphenyl benzene, the molecular condensation having evidently gone a step further. A graphic representation of these reactions is given. [See below.]

(1) Burgess and Wheeler. "Jour. Chem. Soc.," 1914, p. 131.
(2) Pictet and Bouvier. "Compt. Rend.," 1913, p. 157.

BENZENE.



[Double bonds are omitted from the ring.]

At 750° C. (a red heat) 32 grams of these solid highly condensed compounds accompanied 115 grams of unchanged benzene. This decomposition of benzene to produce diphenyl by passing through a red-hot tube has been known since the time of Berthelot and is a recognized method of preparing diphenyl. On the other hand, although benzene is found in some quantity in coal gas and tar, diphenyl is only present in minute quantities which can hardly be separated.

We are here faced with one of those so-called differences between theory and practice, or between laboratory and large-scale results, which indicates that important factors in the operation have not been taken into account. In this case the reason is suggested in the results of experiments made by Mr. Hollings [3] and myself, and published in the "Transactions of the Institution of Gas Engineers, 1914." It was there noted that benzene was not decomposed at 800° C. under conditions similar to those described above excepting that the benzene was present in a state of high dilution with hydrogen and methane, to represent approximately the conditions of carbonizing practice. Dr. Dufton and I, therefore, repeated our experiments—in the first place using benzene highly diluted with nitrogen. Decomposition was lessened, and the yield of such solid condensates as diphenyl lowered. We then tried substituting hydrogen for the nitrogen. Since the decomposition of benzene to diphenyl liberated hydrogen, the presence of this gas in quantity from the beginning should tend to counterbalance the reaction, and so limit the decomposition. We found it to do so. By gradually diluting further and further with hydrogen, the amount of molecular condensates—such as diphenyl—produced at 750° C. gradually diminished, until when hydrogen was simply bubbled through benzene, and the latter, therefore, became only about 8 p.ct. by volume of the gas mixture, only traces of diphenyl were produced—the benzene being practically undecomposed by the treatment. What this indicated was that the condensation of benzene, with the elimination of hydrogen, might well be reversible, and an experiment was therefore made in which diphenyl was placed in the carburettor and hydrogen was bubbled through it—being saturated at 90° C. A small quantity of liquid was found in the condensing train at the end of the experiment and identified as benzene. The condensation of benzene to diphenyl was so proved to be reversible, and it is so indicated above in the equation representing the reaction. The reason is now clearly established for the stability of benzene in carbonization, at such temperatures as 800° C., and the almost complete absence of diphenyl, although the latter is so easily produced from benzene in an ordinary laboratory experiment at the same temperature.

Some points of interest to practical men may be noted in connection with the solid condensates which had been obtained from the benzene nitrogen mixture at 750° C. They contained no naphthalene and no unsaturated compounds, such as consumed sulphuric acid in their treatment; nor did they yield any pitch on distillation. Moreover, very little carbon was deposited in the hot silica tube.

So far our experiments had been limited to 750° or 800° C.—a medium carbonizing temperature. At the higher temperature of 900° C., even in high dilution with hydrogen, benzene was found to be freely decomposed, with the deposition of grey methane carbon in the hot-coke layer (the particles being cemented together by it), and separation of softer black sooty carbon at the cooler end of the tube and in the issuing gas stream. The process of decomposition had become more drastic. Mr. Hollings and I had previously found that benzene, even when highly diluted with methane and hydrogen to imitate carbonizing conditions, disappeared completely at 1100° C.

We may summarize the decomposition of benzene thus

Benzene.

C_6H_6, liquid benzene, single ring,
At 600° C.:
Condenses to
$C_{12}H_{10}$ solid diphenyl, double-ring, eliminating H_2 gas.
At higher temperatures:
Condenses further to triple-ring with elimination of
More H_2, and ultimately to solid carbon.

(3) Hollings and Cobb. "Trans. Inst. Gas Eng.," 1914, p. 254.

Always bearing in mind that the presence of hydrogen (as in carbonizing practice) almost nullifies the decomposition up to a temperature of 800° C.

TOLUENE.

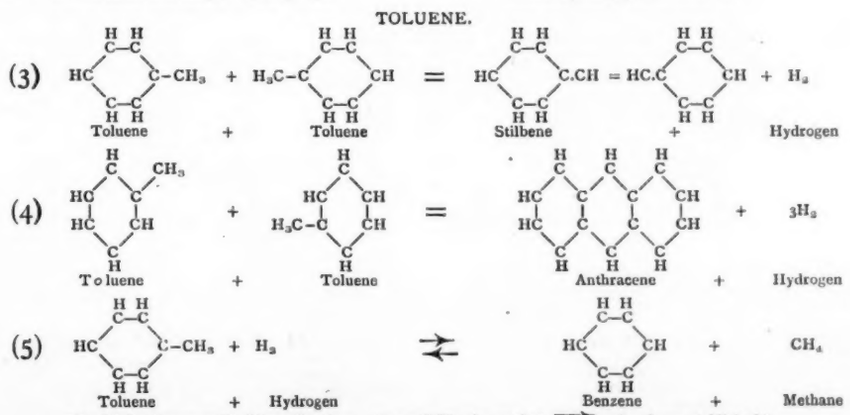
The next experiments were made on toluene (C_7H_8), which may be regarded as a benzene ring with an attached $-CH_3$ group. The first decomposition of this compound when vaporized and carried through the coke by a stream of nitrogen was noted at 550° C. (a dull red heat), and at 600° C. sufficient of the new solid compound was produced to admit of its examination. It was found to be stilbene $C_{14}H_{12}$ or $C_6H_5CH = CH - C_6H_5$, which resembles the diphenyl formed from benzene in containing two benzene rings, but differs from it in being an unsaturated compound. At the same time an oily substance was formed. Thus the first decomposition of toluene, like that of benzene, was found to be one of condensation from a single-ring to a double-ring compound. But, as was readily comprehensible upon chemical grounds, it differed in taking place in more than one direction, as indicated by the presence of the oil, and in forming an unsaturated compound, such as would take up sulphuric acid in a washing process. At higher temperatures increasing decomposition was noted, and at 750° C., it was quite extensive. The solid products of decomposition or molecular condensation, on examination, yielded both naphthalene (double-ring compound) and anthracene, and consisted partially of unsaturated substances, as was plainly shown by their high consumption of sulphuric acid on washing—resulting in a black viscous liquid. The plainest distinction from the behaviour of benzene was, however, yet to come. On substituting hydrogen for nitrogen as the carrier gas, it was found that decomposition of the toluene was very much accelerated, with the production of large quantities of benzene and smaller amounts of solid condensates. The gas collected at the end of the train contained considerable quantities (up to 50 p.ct.) of methane. There is no difficulty in interpreting these results; but the graphic representation of the several reactions involved [as given below] may be useful.

The formation of molecular condensates, such as stilbene, takes place with the liberation of hydrogen. If, then, a large quantity of hydrogen is present initially, the action is checked, as explained in connection with the formation of diphenyl from benzene. The hydrogen atmosphere can, however, act directly on the toluene, reducing it to benzene by combining with the CH_3 group to form methane. It is interesting to note that this reaction, too, is reversible. On passing a mixture of methane and benzene through red-hot coke at 750° C., and examining the products, they were found to consist mainly of undecomposed benzene with some diphenyl, but to contain also a small quantity of toluene. The formation of toluene from benzene is, therefore, possible in this way; but it is effected only very slowly and under special conditions. The main difference between the decomposition of the two substances, benzene and toluene, lies, therefore, in the action of hydrogen. The deccmposition of benzene is prevented by hydrogen, because it counterbalances the tendency to form diphenyl, which would require the elimination of hydrogen. It facilitates the decomposition of toluene by combining with its CH_3 group, and so reducing the original compound, toluene, consisting of a ring and an attached group to benzene—a simple ring, forming methane at the same time. These considerations are probably of wide application in the complex process of carbonization, and I shall return to them. But for the moment I call your attention to the summary which follows of the process of decomposition of toluene:

Toluene.

C_6H_5 (nucleus) $- CH_3$, liquid toluene. (group)
At 600° C.:
Condenses to such compounds as $C_{14}H_{12}$, solid stilbene,
Double-ring, eliminating H_2 gas.
At higher temperatures (800° C.): yields and
Condenses further benzene CH_4 by
In nucleus (by action of H_2) union of
With elimination of H_2, CH_3 group
Giving anthracene, &c. (triple-ring) and H.
At still higher temperatures (1000° C.:
Nucleus condenses further
And ultimately yields solid C.

TOLUENE.



[Double bonds are omitted from the rings. Reversibility shown thus ⇌ only where established.]

Bear in mind that, although the presence of hydrogen (as in carbonizing practice) lessens the formation of solid molecular condensates, it promotes the decomposition of toluene by reducing it to benzene.

The hydrocarbon next to toluene in the same chemical series is xylene or rather the three xylenes ortho-, meta-, and para-, boiling from 143° to 138° C. The decomposition of a sample boiling at 138° to 140° C. was very similar to that of toluene, yielding in an atmosphere of hydrogen at 750° C. toluene and benzene by reduction, and a limited quantity of solid condensates. These three substances benzene, toluene, and xylene, boiling respectively at 80° C., 110° C., and 140° C. (average) constitute the most important ingredients of the light-oil fraction in the tar from medium temperature carbonization (800° C.). Cresol, the characteristic constituent of the "cresol" fraction in tar distillation, is also reduced extensively at 750° C. in a stream of hydrogen to toluene, and necessarily to benzene also.

CARBONIZATION.

There is clearly indicated a tendency for hydrogen (always present in quantity in the products of carbonization) to reduce the single-ring benzene compounds to benzene, and at the same time to preserve benzene itself. A similar action of hydrogen may be inferred as in every way probable on the attached groups of more complicated ring compounds—resulting in the formation of naphthalene and anthracene. Hence it is not surprising that William Young and Thomas Glover[4] pointed out in 1897 that carbonizing at high temperatures made for the predominance of benzol and naphthalene in the products, and scantiness of the higher benzols, phenols, and paraffins.

I believe that the study which has just been described of the decompositions undergone by benzene and toluene may not only be regarded as useful in itself, because of the great importance of these substances at the present time, but may be of service in other ways. I have already referred to its results, as exemplifying the paramount necessity for careful consideration of the various chemical and physical conditions attaching to any carbonization reaction, if its real significance in practice is to be gauged with any degree of accuracy. Having regard, moreover, to the exceeding complexity of these conditions it is obvious that necessary specific information can as a rule only be obtained by direct experiment on the working scale, although we may hope for useful indications and valuable suggestions from the laboratory. We see clearly why the process of carbonization can never be regarded as a simple effect of heat independent of the gaseous atmosphere in which it is conducted, and the way in which we may hope to modify the results of carbonization in various directions by the deliberate control of that atmosphere. The experiments on benzene and toluene lead to a quite definite conception as to how hydrogen may exert its influence in preventing or else minimizing those decompositions which are of the nature of molecular condensations—such as the passage of a one-ring into a two-ring or three-ring molecule; and, on the other hand, how hydrogen may promote decompositions tending to simplification of molecular structure by combining with attached groups and promoting their detachment. Both effects will tend to set and keep a course for the reactions in carbonization which will lead to the minimum production of heavy molecules, such as may be taken to constitute the bulk of the heaviest tar fractions and solids.

I may mention that an attempt has been made to treat coal under conditions which may be taken as the extreme logical application of this effect of hydrogen in determining the nature of the products. Bergius[5] has described a process in which coal is heated with hydrogen or hydrogen mixtures under high pressure (preferably above 100 atmospheres) in an apparatus resembling the cylinder commonly used for storing oxygen, hydrogen, and other gases, but larger. He claims that the hydrogen reacts readily, giving liquid products or easily melting solids; and the process has been described as the "liquefaction of coal." He also claims the application of the same process to such products of carbonization as tar and pitch, stating (as exemplifying the results obtainable) that 1 kilo of tar heated with hydrogen to 400° C. at 100 atmospheres pressure for four hours, and afterwards distilled to 250° C., gave about 60 p.ct. of distillate resembling petroleum oil. The general reaction relied upon is no doubt the same as the conversion of solid diphenyl into liquid benzene by hydrogen, previously described, the effect being intensified by pressure.

This method of treating coal had just reached the stage of works' trial in Germany when the war broke out in 1914, and I do not know the degree of its success. The treatment is rather heroic; and one would be interested to know what are the various costs of installation, operation, and depreciation.

Turning to more normal practice, it is interesting to note that very considerable experimental work has been done by gas engineers during the last few years in which this principle of the importance of atmosphere has been applied. It is one sign of a new vigour in the intellectual life of the industry. Much has been done in consequence of a persistent determination to satisfy existing needs for explosives and liquid fuels. But, apart from this, a greater breadth in mental outlook on the technique of the industry has undoubtedly arisen from removing the incubus of obsolete standards, which definitely discouraged or even prohibited those developments that were and are so urgently needed for the rational utilization of our fuel supplies. In this connection, I need only remind you of Lord Moulton's advice in his Presidential Address delivered in June to the Institution of Gas Engineers, that the gas industry should never again be content to submit to the cramping conditions of the past.

In justice to our predecessors, we may recall that the late Prof. Vivian Lewes made experiments at the Crystal Palace in 1900 on the influence of sending water-gas through horizontal and inclined retorts, and no doubt his experiments might have been developed further under other conditions. But it is only the advent of the vertical retort which has made it possible to subject the descending charge during carbonization to the really effective contact, penetration, and action of an ascending stream of gas. On various plants during the last few years such experiments have been conducted on a considerable scale. The influence of hydrogen has been already partially discussed, and hydrogen in quantity, although not unmixed, can be readily brought into the retort either as coal gas stripped of its bye-products, or as water-gas, while it can also be supplied indirectly by blowing in steam, and depending upon the water-gas reaction which necessarily occurs when this steam impinges on red-hot coke at the bottom of the retort.

The action of a gas in the retort may be regarded in two ways. Even an inert gas, such as nitrogen, would not be without effect, because it would so to speak wash the volatile products of decomposition out of the pores of the coke, assist their volatilization by lowering their concentration in the vapour phase, and hurry them away from the region of decomposition. A gas like hydrogen, being so light, has greater diffusive power, its molecules travel their zig-zag paths at a higher speed, and it is, therefore, even better able to penetrate the pores and perform these duties. But the all-

(4) William Young and Thomas Glover. "GAS JOURNAL," 1897, Vol. LXX., 1626.

(5) Bergius. "Jour. Soc. Chem. Ind.," 1916, pp. 167, 732.

TABLE I.—*Results with and without Steaming in Vertical Retorts Compared.*

Gas Results (*a*).

Tests.	(1)		(2)		(3)		(4)	
	(*a*)	(*b*)	(*a*)	(*b*)	(*a*)	(*b*)	(*a*)	(*b*)
Quality, B.Th.U. per c.ft. . .	530	(100)	522	(100)	503	(100)	503	(100)
	510	(96)	494	(95)	460	(92)	442	(88)
Quantities per ton, gas c.ft. .	12049	(100)	14084	(100)	14989	(100)	14989	(100)
	15500	(129)	17460	(124)	17759	(118)	21684	(145)
Heat units, B.Th.U.	6385000	(100)	7351848	(100)	7538461	(100)	7538461	(100)
	7905000	(124)	8625734	(117)	8169140	(108)	9585328	(127)
The following shows the capacity of each retort per diem.								
Coal, tons	(*c*)	(100)	3·88	(100)	3·63	(100)	3·63	(100)
		(90)	3·56	(92)	2·94	(81)	2·74	(76)
Gas, c.ft.	(*d*)	(100)	54716	(100)	54277	(100)	54277	(100)
		(116)	62203	(113)	52198 x	(96)	59141	(109)
B.Th.U. in gas	(*d*)	(100)	28561752	(100)	27400000	(100)	27400000	(100)
			30728282	(107)	24000000 x	(88) x	26200000 x	(96) x

NOTE.—It will be noticed that in all cases to obtain the increased gas and heat units (the two cases marked x are however decreased) the cubic throughput of coal has been decreased.

(1) Mr. Blundell, "GAS JOURNAL," Oct. 30, 1917.
(2) Mr. J. West, "GAS JOURNAL," Nov. 13, 1917.
(3) and (4) Mr. J. West, "GAS JOURNAL," Dec. 18, 1917.
(*a*) Figures above the line = without steaming, } " below " with "

(*b*) Figures (in brackets) = ratios of actual values.
(*c*) Mr. Blundell states: "Throughput of coal = about 10 p.ct. less."
(*d*) Calculated from *c*) (x) See note above.

important action of hydrogen is chemical, as has been already sufficiently emphasized; and other gases cannot be expected to exercise the like chemical influence. Their physical action is no doubt similar, but rendered less effective by their higher density and lower diffusive power. The general effect of the ascending gas stream to be anticipated is that of lowering the average molecular weight and physical density of the heavier products of carbonization, while increasing the yield of gas and of the lighter constituents in the tar. This accords with experience, and when in action tends to emphasize the difference which already exists between the products of the vertical and horizontal retort in virtue of the lessened extent to which the primary volatile products of carbonization in the former are subjected to the influence of red-hot coke and radiant heat.

In so far then as the secondary products of carbonization are required—and we must remember that this class includes benzene and toluene and other valuable materials for the making of dyes and drugs—the processes and plants which excel in the rapid extraction and removal of products without extensive decomposition may have their drawbacks. The light oil and other tar constituents tend to retain the paraffinoid composition which seems to be characteristic of the chemical groups first detached from coal when it is subjected to heat. At the same time we must bear in mind that the yields of light oil (motor spirit) and fuel oil—two commodities with enormous possibilities in an ever-expanding market—are increased, and that the same applies to the gas itself. Moreover, it is evident that there is no inherent impossibility in so modifying the design of our carbonizing appliances—of the retort and its setting—that the carbonization itself may be carried out at the temperatures and under the conditions which are best for the process, and that the volatile products of carbonization leaving that part of the retort may be deliberately subjected to another temperature or other conditions which will bring about desired changes in their character. This is a question of design. It should offer no insuperable difficulty to the constructional gas engineer of to-day, and still less I hope to the scientifically trained gas engineer of the near future.

I mentioned earlier that, instead of sending water-gas through the retort, steam might be blown in. Something can be said for both ways of working. Heat has to be supplied in either case for the decomposition of the steam by carbon; and it is undoubtedly cheaper to supply this heat on the water-gas plant by the combustion of a portion of the carbon in air than it is to convey the necessary heat through the walls of a retort. Moreover, unless the temperature inside the retort is high, the water-gas reaction occurring there is liable to produce an inconvenient amount of carbon dioxide. On the other hand, steaming of the retort has another function which it performs in my opinion very much more satisfactorily than can be expected from water gas. I refer to the production of ammonia, which is I believe likely to play an important part in the near future in the development of economical carbonization.

At this stage I should like to refer to results which have been obtained by the steaming of vertical retorts, and published. Mr. Frank Clark has tabulated some of these results in an interesting manner which renders their comparison an easy matter. [See Table No. I.] The percentage increase in the quality of the gas as indicated by B.Th.U. per cubic foot, and in quantity as indicated by the cubic feet per ton, can be easily read off, as also the most important figure of heat units obtained in gas per ton of coal carbonized. The improvement in gasification is manifest, and on turning to Table II. is seen to have been accompanied in every case by an increased production of ammonia. Mr. Lawrence Hislop's useful and continuous work at Uddingston is completely confirmatory, and points just as clearly to the possibilities of this method of operation.

AMMONIA.

I should like to point out, however, that what has been done so far is not to be taken as the limit of what is possible. As regards ammonia recovery, too much stress has, in my opinion, been laid upon the reaction associated with the name of Tervet.[6] Frequent reference is made to his results as justifying the assumption that the passing of hydrogen through coke results in the liberation of quite large quantities of ammonia. Tervet gives results from 29·65 to 57·02 lbs. of sulphate of ammonia obtained from the same coal in the laboratory by him in successive experiments—the temperature and flow of hydrogen being increased gradually. It is noticeable, however, that Tervet limited his claim to the effect of nitrogen at a certain stage in carbonization when the free evolution of gas ceased; and in one passage of some significance he stated that a coke incapable of yielding hydrogen on prolonged ignition evolves no ammonia in a current of hydrogen. These limitations leave the subject in a state of undesirable obscurity. The quantity of nitrogen left in ordinary gas coke is about 50 p.ct. of that in the original coal; and, both financially and technically, it is plain that great importance should attach to any reasonable possibility of obtaining this coke nitrogen as ammonia.

Supposing the influence of atmosphere to be important, it becomes advisable to know how the coke behaves with different gases. Some years ago Mr. C. A. King made some experiments for me on this subject in the laboratory of the Farnley Iron Company. Cokes and coals were subjected to the action of a number of gases at a temperature of 800° C., the ammonia formed being absorbed in acid and determined. The temperature of 800° C. was chosen as promising the best results after preliminary experiments. Some results are here collected.

In the first place [see Table III.], it will be noticed that dry hydrogen did not liberate any large quantity of nitrogen from soft coke as ammonia, and that the only gas which did so was steam, either alone or else accompanied by hydrogen or nitrogen. The Tervet action may, therefore, have its place; but steam is the great ammonia producer, if it can only be utilized effectively. It is known from Mond gas practice that, by the use of air and steam, from 90 to 100 lbs. of ammonium sulphate can be produced from an ordinary bituminous coal containing 1·35 p.ct. of nitrogen—*i.e.*, about 70 p.ct. of the nitrogen can be recovered as ammonia. Even better results can sometimes be secured in the laboratory by steam alone; but it may very well be argued that these results can only be obtained by a gasification of the carbon, which gradually opens-up the way for the attack of steam on every molecule of the contained nitrogen compound, and the consequent production of ammonia. The idea of such complete gasification by steam in retorting practice is at first sight fascinating; it is, indeed, a form of the continuous water gas process

(6) Tervet. "Jour. Soc. Chem. Ind.," 1883, p. 445.

TABLE II.

Steaming Vertical Retort Charges.

COMPARATIVE FIGURES FOR NH_3 (*a*).

Authority	Mr. J. West (*b*)		Mr. Blundell (*c*)		Amsterdam (*d*)	
Duration of charge (hours)	continuous working				12/12	
Steaming (hours)	continuously				2/6	
		(*e*)		(*e*)		(*e*)
Sulphate per ton (lbs.)	28·0	(100)	20·5	(100)	26·0	(100)
	36·8	(131)	27·5	(129)	31·4	(120)
Increased sulphate (lbs.)	8·8		7·0		5·4	
(pence) (*f*)	13·2		10·5		8·1	

(*a*) Figures above the line = without steaming.
,, below ,, = with ,,
(*b*) "GAS JOURNAL," Nov. 13, 1917.
(*c*) ,, ,, Oct. 30, 1917.
(*d*) ,, ,, Feb. 6, 1917.
(*e*) Figures in these three columns are ratios of actual values.
(*f*) £14 per ton.

TABLE III.—*Ammonia from Coke.*

Nitrogen Obtained as NH_3 from 100 Grams of Coke.
Typical Experiments at 800° C.

Coke.	Gas.	N. in * 15 Mins.	N. in 1 Hour.	Total N.	Recovered in Lb. $(NH_4)_2SO_4$ per Ton Coke.
Soft coke A. in dry gases	N	*Nil*	*Nil*	*Nil*	*Nil*
	H	0·04	0·08	—	8·4
	CO	*Nil*	*Nil*	*Nil*	*Nil*
	CO_2	*Nil*	*Nil*	*Nil*	*Nil*
	CH_4	—	—	—	—
Soft coke A in steam		0·57	0·71	0·71	74·5
In gases saturated with water vapour at 85° C† — Soft coke A in	N	0·03	0·17	0·51	53·5
	H	0·21	0·67	—	70
	CO	*Nil*	*Nil*	*Nil*	*Nil*
	CO_2	0·03	0·08	—	—
	CH_4	—	—	—	—
	N	—	—	—	—
Hard Beehive coke in	CO	*Nil*	*Nil*	*Nil*	*Nil*
	CO_2	—	—	—	—
	CH_4	*Nil*	*Nil*	*Nil*	*Nil*
	H	0·05	0·10	0·10	10·5

Proximate Analyses.

Soft Coke A.
Vol. matter = 4·7 per cent.
Ash = 12·2 ,,
Nitrogen = 1·19 ,,

Hard Beehive Coke.
Vol. matter = *Nil* per cent.
Ash = 11·0 ,,

* *i.e.*, weight of nitrogen in gas evolved as ammonia in 15 minutes.

† *i.e.*, containing 57 p.ct. of water vapour by volume.

TABLE IV.—*Ammonia from Coal.*

Nitrogen (as NH_3) and Coke obtained from 100 Grams of Coal.

Typical Experiments at 800° C. in Moist Hydrogen.

Yorkshire Bituminous Coal.	Gas.	N in 15 min.	N. in 1 hr.	Recovery in Lbs. of $(NH_4)_2SO_4$ per Ton of Coal.	Coke after Expt.	Coke Gasified (as Per Cent. on Coal).	Proximate Analysis of Coals.			
							Volatile Matter.		Coke.	Nitrogen.
B	Saturated at 85° C.	0·31	0·44	46	66	1·0	B	33	67	—
C		0·49	0·70	73	60	3·4	C	36	64	1·30
D		0·31	0·42	44	61	2·5	D	37	63	1·31
E		0·29	0·38	40	69	2·9	E	28	72	0·97

which has attracted many minds. The difficulties of its complete realization are, however, very great. It would hardly be possible to make a working success of any of our retorting plants, or of any plants resembling them, if it were necessary to transmit through the walls of the retort, not the comparatively small quantity of heat required for carbonizing but the comparatively enormous amount necessary to gasify completely the carbon by the water-gas reaction, which absorbs 4320 B.Th.U. for every pound of carbon converted into carbon monoxide. Even if it were practicable to supply sufficient heat, a choice would have to be made between working at a temperature low enough to conserve the ammonia (which would result in the production of an inconveniently large quantity of carbon dioxide), or working at a temperature high enough to keep the carbon dioxide within reasonable limits, with consequent destruction of ammonia.

There remains, however, the question whether anything like complete gasification of the coke is necessary to allow contact between steam and the nitrogen compounds in the coke sufficiently effective to improve materially the ammonia yield. If we now look at Table IV., the results there set out indicate that without the gasification of more than a very small percentage of the coke, it is possible by treatment with steam and hydrogen to liberate a considerably larger proportion of the ammonia than is recovered in any ordinary carbonization process.

I should like, however, to refer to one or two limiting considerations, important in large-scale operations. In the laboratory experiments, turning back to Table III., it is noticeable that only steam was able to give any large ammonia yield from coke, and that other gases had little or no tendency in this direction. No doubt, nitrogen and hydrogen would tend to preserve any ammonia formed, and no doubt even a gaseous current of no chemical import would be of service in washing the newly formed ammonia from the pores of the coke and sweeping it away before it could decompose. This is of itself very useful, because in the ordinary atmosphere of carbonization at 800° C., any ammonia formed would be almost completely decomposed if it were not so swept away into cooler regions. But substantially, as I said before, steam is the ammonia producing agent, and since it can never dominate in quantity in the same way in the gas-retort as in the laboratory experiments, it would be unwise to prophesy how nearly results obtained under laboratory experiments can be approached on the working scale.

I would also call your attention to the very low result obtained even with moist hydrogen [Table III.] from hard beehive coke. It is evident that when coke is sufficiently hard, it is very resistant to the chemical attack of any gas; and this is no doubt the reason for Tervet's negative results with hydrogen and long-ignited coke, and also the reason incidentally why gasification of such material as coke-oven breeze and dust in gas-producers by the Mond process is unsatisfactory both in rate of gasification and in ammonia yield. Hence the necessity for large-scale trials. It may be said, with truth, that such trials have already been made, but they have been made with existing appliances, which were naturally unsuitable in detail for the purpose. I suggest that the possibilities are of such importance to the gas industry that a very thorough trial is justified under conditions which allow of passing into the retort measured quantities of steam either alone or mixed with other gases. Moreover, in order to minimize the cooling effect on the charge, it should be made possible to superheat the steam to any desired extent, and to introduce it at any point. If the ammonia yield can be appreciably increased, it is evident that the cost of the necessary structural alterations would be of trifling consequence.

THEORETICAL.

Finally, I should like to recall your attention to the experiments made on benzene and toluene, with special reference to the tables in which their mode of decomposition is briefly summarized. The decomposition of benzene on heating may be regarded as one of the simplest forms which the process of carbonization can take. It is that of a single-ring compound, and seems to consist in essence of a molecular condensation—the joining-up of carbon rings with elimination of gas. Toluene introduces modifications resulting from the attachment of a single group to the original ring. Again the decomposition commences with molecular condensation and elimination of hydrogen, but is less simple in character, and is soon complicated by the interaction of hydrogen expelled from the nucleus with the CH_3 group so as to form methane. With both benzene and toluene, certainty of statement only attaches to the earlier stages of decomposition which we have actually worked out. The later stages are under examination, and their description is hypothetical.

It is interesting to note that the two gases, hydrogen and methane, are dominating constituents of coal gas, and their formation in the carbonization of coal may be regarded as taking place in a similar way—the hydrogen from molecular condensation, and the methane from interaction of H and CH_3 groups. In Table V. the carbonization of coal is represented from this standpoint. It is evidently not a complete scheme of carbonization, since for the present oxygen in the nucleus is not included in it, but it brings out the dominant part played by hydrogen in the process.

TABLE V.—*Coal.*

(Carbon hydrogen Nucleus) < CH_3 groups; Other groups more loosely attached.

Yields up to 600° C.: Nucleus ——— CH_3 condensed with elimination of H_2 + Groups detached (with addition of H_2) liquid and gaseous.

Yields up to 800° C.

Nucleus further condensed with elimination of more H_2 + CH_4 (by addition of H)

Yields up to 1000° C. and higher temperatures.

Nucleus condensing ultimately to carbon + H_2.

The detached groups undergo secondary decompositions.

The nucleus in this case is not a single substance, for as pointed out in the valuable monograph upon the "Constitution of Coal" published recently by Dr. Marie Stopes and Dr. R. V. Wheeler, coal probably consists of a number of different degradation products of the original coal substance, and each of these may decompose on carbonization in a somewhat different manner. The process in general will, however, be of the character indicated in Table V. Vignon,[7] who examined the gaseous products of carbonization collected at different temperature intervals, felt justified in dividing the carbonization process into three stages. In the first stage came off unsaturated hydrocarbons, higher paraffins, phenols, oils, &c. In the second stage, methane was the principal product; and in the third stage, hydrogen. The results of gas analysis are given in Table VI.

TABLE VI.

—	400° C.	600° C.	850° C.	1000° C.	1150° C.
CO	2·60	7·70	11·40	9·50	19·40
H_2	0·00	22·84	68·98	78·53	74·10
CH_4	84·30	59·82	7·18	5·66	0·00
CO_2	6·00	5·00	4·60	0·80	1·80
O	2·40	1·00	1·30	0·20	1·00
N	1·00	3·13	6·00	4·59	3·00
Hydrocarbons absorbable by bromine	3·40	0 40	0·20	0·70	0·00
Volume of gas in litres	5·00	10·00	5·50	7·10	5·00 Total 32·6 litres
Duration of distillation	3 hours	5 hours	3 h. 30 m.	1 hr.	1 hr. Total 13 h. 30 m.

The work of Dr. Wheeler and his collaborators is in substantial agreement with that of Vignon in this respect, and the results of a thermal study of the carbonization process by Mr. Hollings and myself[8] is consistent with it. It may be seen that the method of representing the results of carbonization which I have adopted in Table V. as a development from the study of the decomposition of benzene and toluene, marks the same succession of phenomena. The loosely attached groups which are shown as breaking away with the addition of hydrogen up to 600° C., are paraffins,

(7) Vignon. "Compt. Rend.," 1912, p. 1514; "GAS JOURNAL," 1913, CXX., p. 107.

(8) Hollings and Cobb. "Jour. Soc. Chem.," 1916, p. 1106.

unsaturated hydrocarbons, phenols, and constituents of paraffinoid tars, such as are produced by low-temperature carbonization. In the ordinary process, these are exposed to higher temperatures before they escape from the retort, and yield the many aromatic ring compounds which constitute medium temperature tar. Higher benzene ring compounds existing as they do in the presence of hydrogen tend to be reduced to benzene, naphthalene, and anthracene—compounds which consist of rings without attached groups. This tendency is more marked when carbonization is conducted at high temperatures—particularly with free exposure to red-hot coke and radiant heat. Such rings ultimately decompose, with the formation of carbon, but with difficulty. The molecular configuration of the ultimate product, carbon, is very difficult to determine. But, as has been pointed out by Rhead and Wheeler,[9] both graphite and amorphous carbon have on oxidation yielded a compound with the characteristic benzene nucleus in its constitution, while Aschan has suggested a formula for carbon which involves again the persistence of benzene nuclei in aggregation. All signs point to the stability of this six-atomed ring under the most drastic treatment—including the great thermal and chemical strains of carbonization.

I may mention finally that a physical method of determining the actual space distribution of the atoms in a crystalline substance has been worked out by Prof. W. H. Bragg and his son, Mr. W. L. Bragg, and has been applied to carbon in the forms of graphite and diamond, although not to coke. In their book, "X Rays and Crystal Structure," is a photograph taken from a model prepared to show, in the simplest possible way, the symmetrical disposition in space of the atoms in a diamond. In graphite, the spacing is widened, as is consistent with a lower density.

(9) Rhead and Wheeler. "Jour. Chem. Soc.," 1913, p. 463.

MANCHESTER JUNIOR GAS ASSOCIATION.

Visit to the Partington Steel and Iron Works.

The enforced experiment of holding a mid-week meeting of the members of the Manchester and District Junior Gas Association, which took place last Wednesday, in the form of a visit to the works of the Partington Steel and Iron Company, at Irlam, proved an unqualified success. The attendance was not only a record one, but it established another "record"—in the sense that the President (Mr. C. E. Teesdale, of Salford), the Council, and the Hon. Secretary (Mr. James Bridge, of Bolton), had the felicity of welcoming all the members who had signified their intention of being present. The Company particularly requested that the Association should visit the works while the plant was running; and the special efforts to do so made by members showed their appreciation of the firm's kindness—kindness in a double sense, that of sparing the time of their experts from their duties for between three and four hours in order to conduct the visitors round the works, and in entertaining them.

RAPID DEVELOPMENT OF THE WORKS.

The Partington Steel and Iron Company, Ltd. (the Chairman of which is Sir Harmood Banner, of Liverpool) was registered on Aug. 11, 1910, as a limited liability company for the manufacture of billets, blooms, rails, angles, girders, and all classes of structural steel; also tube, electrical, and all the best qualities of nickel and other alloy steels by the basic and acid open-hearth and electrical processes. The plant is entirely modern, and consists of iron ore mines, coke-ovens and bye-products plant, blast-furnaces, steel-furnaces, rolling mills, and the necessary engineering shops and power station for the running and equipment of the works. The feature of the works is that the finest qualities of all high-grade classes of steel are specialized in.

The coke-ovens were started on March 24, 1913; the blast-furnaces following on Aug. 9, 1913. The steel-furnaces were put into operation on March 8, 1914; and the mills commenced to roll steel on Feb. 4, 1914—five months before war broke out. Shortly afterwards, the works were turned on to the manufacture of shell steel, gun forgings and mountings, forgings for engines, steel for aeroplanes, and other munitions of war. During the last eighteen months considerable extensions have been in progress, and are still being carried out.

INSPECTION OF THE WORKS.

Despite the very inclement weather, the large party traversed the works under the guidance of Mr. Herbert Sissons, the Chief Chemist, Mr. Charles Champion, the Chief Draughtsman, Messrs. Duncan Chasser and Thomas J. Roberts, draughtsmen, Mr. D. S. Cunnah, foreman over the extension of the coke-oven section, and other gentlemen. Mr. Frank Cooper, the Managing Director of the Company, was unfortunately prevented—through business cares elsewhere—from being present. The tour of the works was a most interesting one. On every side the visitors were afforded practical demonstration of the British Empire, with its illimitable resources, being able, if need be, to carry on the war for any number of years. One noticed, *en passant*, that there were a good number of German prisoners of war employed at the works in minor duties—away from the manufacturing sections.

Formal Meeting of Members.

After an adjournment for tea,

The PRESIDENT said the members would now resolve themselves into an extraordinary general meeting, with the object of considering (in accordance with Rule 15) the increase of the subscription from 5s. to 6s., in accordance with the notice of motion given at the annual meeting at Manchester in April.

Mr. S. CARTER (Liverpool) said the proposed increase was a very modest one. The Council at their March meeting, after considering the balance-sheet for the 1917-18 session, approved of the suggestion that the annual subscription be raised.

Mr. W. FLETCHER (Senior Vice-President) seconded the motion, which was unanimously agreed to.

THE ASSOCIATION'S THANKS.

The PRESIDENT congratulated the members on having been afforded the opportunity of inspecting the Partington Steel and Iron Company's works. The large attendance showed that the gas engineer and manager of to-day was alive to the usefulness of the Junior Association. There had been a splendid turnout that afternoon; and he was particularly pleased to see the way members of the Manchester District Institution of Gas Engineers had accompanied them. Both young and old were joining together for what was, he hoped, to be a mighty session. The experiment of a mid-week visit had proved—to himself at any rate—the advisability of continuing at least one visit per session in mid-week, or during the week. Or they might hold two mid-week meetings. A suggestion had been made that the whole course should be altered, and that all their meetings should be in the middle of the week. Some of them did not care to give up their Saturday afternoons; but that was a matter for the Council to bear in mind. They had had a splendid afternoon in regard to sight-seeing—a maze of things, of which it was impossible to get a grip in the short time at their disposal. They were very much indebted to Mr. Cooper and his staff. He (the President) was particularly pleased that Mr. Sissons had been instrumental in arranging their visit that day, inasmuch as he had intimated his intention of being proposed as a member of the Association. They would be delighted to see him at their meetings and visits. After paying tribute to the efforts of the other works' escorts, he complimented the Manager of the Works Canteen (Mr. Burgess), and announced that the delectable dainties with which they had been provided were made in the canteen by the firm's own cooks. He asked Mr. Holton to second the vote of thanks to the Directors of the Partington Steel and Iron Company, Mr. Cooper, and to all who had escorted them round the works.

Mr. A. L. HOLTON, in seconding, said the Company were to be congratulated on their foresight. Modern practices were adopted. For instance, one could not help noticing that blast-furnace gas, which was necessarily of low calorific power, was used for heating the steel melting furnaces. The possibilities in this connection were, in this and other districts, very great.

The vote of thanks was unanimously accorded.

Mr. SISSONS, in responding, said Mr. Cooper would be pleased to learn how the members had appreciated their visit. When the projected visit was mentioned to him, he readily consented to it.

Other formal votes of thanks concluded the proceedings.

Analysis of Spent Oxide.

According to an abstract in the "Journal of the Society of Chemical Industry" of an article in a German technical paper, the following methods are employed for controlling the sale and purchase of spent oxide. *Moisture, &c.* 25 grms. of the powdered sample are dried at 80° C. for about four hours, or till the loss in weight between two successive weighings does not exceed 0·05 grm. *Sulphur.* 10 grms. of a dry sample are shaken occasionally during a few hours with 75 c.c. of carbon tetrachloride; then diluted with the solvent to 105 c.c.; mixed; and allowed to settle. Then 50 c.c. of the clear solution are filtered into a small weighed flask; the filter washed with carbon tetrachloride; the contents of the flask evaporated; and the residue of sulphur weighed. *Ferrocyanide.* 10 grms. of the dry sample are shaken with 50 c.c. of 10 p.ct. potassium hydroxide solution. After sixteen hours, the mixture is diluted to 255 c.c.; filtered; and 100 c.c. of the filtrate treated with 25 c.c. of hot ferric chloride solution (ferric chloride, 6 grms., hydrochloric acid, 20 c.c., water, to 100 c.c.). The mixture is heated at 80° C. for some time; filtered; and the filtrate agitated with 20 c.c. of 10 p.ct. of potassium hydroxide solution until the blue colour has disappeared. The whole is then diluted to 250 c.c.; 1 grm. of lead carbonate is added; and, after filtering, 100 c.c. of the filtrate is acidified with 5 c.c. of sulphuric acid (1 : 5), and titrated with copper sulphate solution which has been standardized against pure potassium ferrocyanide under the same conditions. Ferric chloride is used as an external indicator.

Eastern Counties Gas Managers' Association.—The autumn meeting of the Association will be held on Thursday, Oct. 3, at the Holborn Restaurant, W.C., when the chair will be taken at 2 p.m. by the retiring President, Mr. J. H. Brearley, of Longwood. The programme will include the induction of the new President, Mr. H. R. Wimhurst, of Bury St. Edmund's; a paper by Mr. E. F. Keable, of Gorleston, entitled "Blue Water Gas Practice in conjunction with Benzol Extraction;" a discussion upon the Household Fuel and Lighting Order, to be opened by Mr. J. H. Troughton, of Newmarket; and a report from the Association's Representative on the National Gas Council. Tea will be served to members and guests at the close of the meeting.

COKE-OVEN MANAGERS' ASSOCIATION.

MIDLAND SECTION.

Visit to the Hoyland Collieries Coking Plant.

The members of the Midland Section of the Coke-Oven Managers' Association, on Saturday afternoon last, visited the coking and bye-product plant at the Hoyland Silkstone Collieries, at the invitation of the Coke-Oven Construction Company, Ltd. (Semet-Solvay system).

The visitors were received by Mr. W. Colquhoun, the Managing Director of the Construction Company, and were conducted over the plant by Mr. Colquhoun, Mr. James Marr, the Engineer to the Company, Mr. F. Parkinson, the Resident Engineer, Mr. A. Hayes, the Manager of the colliery, Mr. J. S. Wynne, the Bye-Products Manager, and Mr. D. N. Hughes, the Manager of the coke-ovens.

The plant (started in February last year) comprises 37 Semet-Solvay ovens, 20 in. by 9 ft. 9 in. by 36 ft., and is believed to be the largest type in this country. Owing to the coal shortage, however, only 34 of the ovens are at present working; and they are not running at full capacity. The number of discharges should be not less than 24 per day from the 34 ovens, and it was recognized that, in all probability, 26 to 28 could be pushed if the supply of slack were adequate. The weight of slack per charge was stated to be 11·65 tons (dry). The ovens are of the horizontal flue type, with five tiers of heating flues on each side. The air-passages are designed to give a fire heat of 450° C. at the point of admittance of the air to the top burners; and the air admitted is so greatly in excess of that required for the burners in the top flue, that it provides also the greater part of the air for the burners in the second and lower flues, and that at a temperature raised in its course to 1000° C. or more. The temperature in the second heating flue is maintained at about 1100° C., and in those below at 1150° C. The hydraulic main inclines from each end to the centre, and is self-cleaning—the wash of liquid preventing the formation of pitch. There are no cleaning doors. The temperature of the gas leaving the main is usually under 30° C. The coke passes through a Darby quencher on to an inclined hearth. The nature of the site demands the use of a coke-conveyor, rising at the far end to deliver on to screens, which take out the wash and ballast.

The washery, built by the Luhrig Company, deals with all coal from the screens 2 in. and under, and has a nominal capacity of 50 tons per hour, 60 p.ct. of which is coking smudge, containing from 28 to 30 p.ct. of volatile matter. The drainage bunker has a capacity of 1000 tons, divided into pockets to ensure 48 hours drainage. The disintegrators, of the Carr type, are in duplicate, with a 150 H.P. motor for each. An under-rail pit and elevator admits of uncrushed washed "foreign" slack being delivered to the disintegrators, to supplement the colliery supply. The service bunker is of tank form, of 600 tons capacity, and is equipped with an automatic reversing distributor which drops the slack into the compression box and operates continuously while the stampers are at work. There are two independent single stampers. The charging machine is combined with a ram and operated by a 25 H.P. crane-rated motor, and is very substantial, to deal with 12-ton charges. The gas-condensers are of the horizontal tube type. There are two steam-driven Bryan-Donkin exhausters—one a stand-by. The tar-extractors are of the "P. & A." type.

A feature which particularly interested the visitors, in addition to the large size of the ovens, was the fact that benzol scrubbing is interposed before the ammonia recovery. It was pointed out that while no material inconvenience is experienced, the necessity of re-cooling the gases after the ammonia saturation is avoided. The Solvay scrubber has a number of compartments with bubbling hoods. Only crude benzol (65 p.ct. at 120° C.) is at present provided for. The benzolized oil is preheated to 120° to 130° C.—first by exchange with the debenzolized oil and afterwards by means of steam. The gases are bubbled through one of two saturators after receiving the stream of ammonia gas from the still. The particular feature of the Nares' patent process here in use is that, where the temperature of the mixture of cold gases and hot ammonia vapour has attained equilibrium, a water separator is interposed to remove the surplus moisture in the form of water fog, and thus prevent the dilution of the acid bath. The gases are raised in temperature 8° to 10° C. while passing through the saturator, and go direct to the oven flues; the surplus going to the five Lancashire boilers.

The power requirements of the plant are met by two sets of 250 KW. Westinghouse alternators, 3 phase, 50 periods, 500 volts, direct connected to 360 H.P. Belliss vertical compound enclosed steam-engines, at 375 R.P.M. The water from the condensers is pumped over a cooling frame, and, after the addition of the make-up water, is pumped into a high distributing tank. The pumps are of the centrifugal type, and duplicated.

A small feature of practical utility, especially noted in the sulphate store, was a raised platform for stacking sulphate bags—keeping them entirely clear of the store floor.

TEA AND A VOTE OF THANKS.

Tea was provided for the visitors at a school in Hoyland village; the hosts being the Construction Company and the Colliery Company.

After an enjoyable repast,

The PRESIDENT of the Association (Mr. J. W. Lee) voiced the members' appreciation of the manner in which the hosts had stepped into the breach when a contemplated visit to Silverwood had had to be deferred. The visit had been highly interesting and enjoyable.

Mr. GEORGE CHRISP (Silverwood), in moving a vote of thanks to the Construction Company, the Colliery Company, and the gentlemen who had conducted the party, said at Silverwood they expected to have one or two things to show the members of the Association, and he hoped it would not be long before the visit to that plant, which had been postponed, could be carried out. The plant they had visited that day had several novel features. The ovens were the largest he had ever seen. The cooling plant seemed to be very efficient. Another point which had struck him was the very fine liming arrangement. He had been much struck by the attention paid in this direction at a large gas-works which he recently visited, and he was glad to see similar attention on a coking plant.

Mr. F. HADFIELD, in seconding the motion, said the great thing that struck him about the Semet-Solvay plant was its strength and durability, and the "above its work" character all round.

The proposition having been carried,

Mr. COLQUHOUN, in response, said it was an honour to the Company to entertain an Association which had proved itself so distinguished. Two years ago nobody would have thought that it would be possible to bring together a group of men capable of producing the series of papers and transactions that had shown the talent that lay in the Coke-Oven Managers' Association and the coking industry. He hoped the day might not be far distant when the Association would be able to visit the new plant being erected at Thorncliffe.

Mr. HAYES and Mr. HUGHES also briefly responded.

The PRESIDENT, after expressing the Association's congratulations to Mr. J. T. Price (their Hon. General Secretary) upon his appointment to the plant at Redbourn Hill, Frodingham, mentioned that the annual dinner of the Association would take place at Manchester on Oct. 26. He also made a strong appeal for support of the new session's evening classes at Sheffield University. In the past there had been lectures on gas engineering and coke-oven work; but it had now been decided that the whole subject of the carbonization of coal as one great combined scheme should be dealt with during the next three years. It was hoped to make it possible for men in any way interested in the subject, whether in coking plants or gas-works or low-temperature carbonization plants, to know the practice and theory of all phases of the subject. He trusted the members would interest their juniors in the course; and if at any time there were any suggestions, Prof. O'Shea or himself would be only too glad to receive them.

Output of Town Gas in America.

Writing in the "Rochester Gas and Electric News," Mr. W. H. Earle estimates that, during the current year, there will be produced in the United States approximately 300,000 million c.ft. of gas, excluding coke-oven gas. Taking this gas, 1000 c.ft. will yield on an average 0·4 gallon of light oil; and from 15 to 20 p.ct. of it will be toluol. Calculating on this basis, if all the gas produced could be utilized in 1918, 120 million gallons of light oil would be recovered, yielding possibly 20 million gallons of toluol. This would make the maximum recovery 2 million gallons short of the minimum requirements. But, he says, it is obviously impossible to obtain this maximum recovery. Many plants are too small to make recovery practicable; many are too remote or isolated; and, unfortunately, many are obliged to produce gas under such extreme legislative standards of quality that it would be impossible to remove the light oil and still maintain the standard.

Mr. Joseph Nicholson, chemical manufacturer, of Leeds, left £161,549; the net personalty being £75,437.

The position of Gas Meter Inspector to the Exeter City Council, applications for which were a few weeks ago invited by advertisement in the "JOURNAL," has been filled by the appointment of Mr. E. M. Foster. For the past fifteen years Mr. Foster has been Chief Assistant to Mr. Frederick Coe, the Official Meter Inspector of Nottingham.

The organization of a Company to manufacture aniline and other dyes has, says the "Board of Trade Journal," been completed at Walkerville (Ontario). As soon as a charter is granted by the Government, the Company will commence the erection of works on the river front at Sandwich. The estimated cost is $1,000,000. H.M. Trade Commissioner in Toronto is informed that the Company will also build a factory at Walkerville, to produce toluol. The decision of the Company to interest themselves in the production of dyes and toluol is said to have been made after several months of consultation with experts from the United Kingdom and the United States.

The "Scientific American" cites, as an example of German duplicity, the patents issued, both in Germany and other countries, covering the Haber process for the fixation of nitrogen. After the war began, and the subject became of importance to other nations, investigations showed that the patents were so vague, and so much essential information had been omitted, that it was impossible to work the process from the descriptions given. In England, our American contemporary remarks, a large force of chemists undertook the investigation of the process; and it has required two years of unremitting labour to work out a method of ammonia synthesis according to the Haber method. During this investigation, it may be noted, several improvements have been developed for which patents have been granted to individual discoverers.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Heating and Cooking at Brighton.

SIR,—Referring to the paragraph in your issue of Aug. 27 [p. 391], it may interest your readers to know that the electrical cooking apparatus is still in use at this hotel, and is doing excellent work. The increase in the power rate—it is now I believe 1¼d. + 25 p.ct.—is, of course, an item of expenditure not contemplated when the plant was installed. But coal has risen more in proportion; and although the increase per 1000 c.ft. of gas is relatively small, you will doubtless have gleaned, from reports of recent litigation, that there are more ways than one of increasing the cost of gas to the consumer—a drawback we have yet to discover in electricity. C. HINDLE, Manager.

Old Ship Hotel, Brighton, Sept. 4, 1918.

[We are much obliged to Mr. Hindle for the information contained in his letter, though, forsooth, there is studied economy in the information; and if it were any other man in the world who signed the letter than Mr. Hindle, we might have suspected that Mr. John Christie, the Electrical Engineer, or one of his assistants, had had a hand in concocting it. Does what is said in the words "the electrical apparatus is still in use in this hotel, and is doing excellent work" comprise all to which Mr. Hindle might have put his pen? And what is the character of the work the statement covers? Mr. Hindle "believes" that the power rate is now 1¼d. + 25 p.ct. per unit—that is to say, 1·56d. per unit. We see that last year Brighton's total electricity working costs, without capital charges, were 1·75d. per unit! But this perhaps has nothing to do with Mr. Hindle. What does concern him is his own payments for providing heat. He evidently finds that the expense of electricity is heavy; seeing that "the increase is an item of expenditure not contemplated when the plant was installed." But he consoles himself by the fact that "coal has risen more in proportion." If Mr. Hindle likes a little arithmetic, just let him consider these figures: A ton of coal has a calorific value which he may accept as being approximately 30 million B.Th.U. Mr. Christie will not dispute this. Supposing coal apparatus has only 20 p.ct. efficiency, this would mean that he would obtain the useful work of 6 million B.Th.U. of the 30 millions. Now as a unit of electricity has a thermal value of 3420 B.Th.U., to obtain the 6 million units that he would secure in work from a ton of coal, he has to use 1755 units of electricity at 1·56d. Thus 1755 units × 3420 B.Th.U. = (approx.) 6 million B.Th.U.; and 1755 units × 1·56d. = £11 8s. 2d. This is what Mr. Hindle is paying for electricity to do the same work as a ton of coal, if his electrical apparatus has 100 p.ct. efficiency, which it has not, and so he is paying still more. With this £11 8s. 2d. before him, how can Mr. Hindle justify his statement that coal has risen in proportion? Perhaps he will point out if there is any flaw in these calculations, to which we may add another. It is that the Coal Controller allows 800 units of electricity per ton of coal, and not the 1755 units (or 6 million B.Th.U.) mentioned above. These 800 units have only a thermal value of 2,736,000 B.Th.U. gross. As to the next matter, it seems to us that Mr. Hindle—particularly in view of the result of the litigation and the remarks of the Recorder—is, in writing that "there are more ways than one of increasing the cost of gas to the consumer," suggesting deliberate fraud on the part of the Brighton Gas Company, to which remark the attention of the Directors may be called. His observation is hardly British in the circumstances; and the sting that is intended in the observation "a drawback we have yet to discover in electricity" may be countered by saying that, if the nation had had to rely upon the electricity undertakings of the country—Brighton among them—for high explosives, liquid fuels, antiseptics, medicinal ingredients, acids, and numerous other things required to carry on the war, we should have been beaten by Germany long since. Yet Brighton possesses men who gird at the gas industry, through its inability to meet all its standards under abnormal difficulties and through national service. At least Mr. Hindle, of the Ship Hotel, might have kept himself free from that attitude, which appears to us neither a fair nor an intelligent one.—ED. G.J.]

The Household Fuel and Lighting Order, 1918.

SIR,—Your correspondent, Mr. Goodchild, states in his letter that my article on the above subject was "evidently based on a misapprehension of the real meaning of the Order." He then seeks, by ingenious argument, to disprove my contention that preferential treatment is meted out to consumers of electricity.

We are informed that, "In the first place, the Coal Controller is obviously concerned to economize the consumption of coal." But this, surely, is thoroughly understood; and it was referred to in the first paragraph of the article in question. Further, the article also states: "Presumably, one of the chief reasons for the promulgation of the Order is the pressing necessity for obtaining every ounce of usefulness from every ton of coal." Your correspondent then continues: "A starting point is made by fixing 3 tons of coke as the equivalent of 2 tons of coal; and this is certainly a preference in favour of the coke." A much better starting point would be to take a ton of coal and then to ascertain the value which can be derived from it in (*a*) a gas-works, and (*b*) in a generating station.

In a gas-works, the distillation of a ton of coal will produce 12,500 (not 11,000) c.ft. of gas, *plus* 10 cwt. of coke, and a variety of bye-products of vital national importance whose intrinsic value should be taken into consideration. The coke is equal to

$$10 \times \tfrac{8}{9} = 6\tfrac{8}{9} \text{ cwt. of coal; and as the remaining } 13\tfrac{1}{9} \text{ cwt. of coal} = 12{,}500 \text{ c.ft. of gas,}$$

$$\therefore \text{ 1 ton of coal} = \frac{12{,}500}{13\frac{1}{9}} \times 20 = 18{,}750 \text{ c.ft. (not (5,000 c.ft. as stated by your correspondent).}$$

The total destruction of a ton of coal in a generating station produces, on an average, 500 (not 800) B.T.U. of electricity,

$$\therefore \text{ 800 units would require } \frac{800}{500} = 1\tfrac{3}{5} \text{ tons of coal.}$$

The electrical consumer who therefore takes 800 units of electricity in lieu of 1 ton of coal really gets the equivalent of 1⅗ tons of coal; whereas the gas consumer who takes 15,000 c.ft. of gas in lieu of 1 ton of coal gets 3750 c.ft. of gas less than his proper equivalent. And, moreover, he gets no credit for the valuable bye-products he has incidentally caused to be produced. In the words of your correspondent, "Is this giving a preference to electricity? The net result of this arrangement will be to encourage the consumption of raw coal in the household, and the destruction of more raw coal in the electricity generating station than is logically justifiable. The natural corollary will be a restricted consumption of gas, and a decreased production of bye-products.

The matter may be regarded from other standpoints. If, for instance, 1 ton of coal were completely gasified at the gas-works as it is completely consumed at a generating station, it would produce an equivalent equal to about three times the Coal Controller's conversion equivalent. Again, if, as a war time measure, certain calorific restrictions could be modified so as to admit of a 20 to 30 p.ct. reduction, the normal make of gas per ton of coal could be doubled, and the production of coke would not be appreciably affected.

Coal is of such paramount importance to-day that not only should the Coal Controller be concerned to economize its consumption—he should also be equally concerned to see that every ounce of usefulness is extracted from every ton of it, which is quite a different proposition. Hence, to stipulate that 800 B.T.U. units of electricity, on the one hand, and 15,000 c.ft. of gas on the other, are true conversion epuivalents of 1 ton of coal, and to imagine that real coal economy lies in this direction, is simply to trifle with a grave state of affairs that should receive more earnest consideration. THOS. NEWTON.

Sept. 5, 1918.

"**A Disgusted Shareholder**" has omitted his name and address; and therefore, in accordance with the invariable rule of the "JOURNAL" in this matter, his letter cannot appear.

REGISTER OF PATENTS.

Inverted Incandescent Gas-Burners.—No. 105,918.

BLOKHUIS, J. K. F., of Middelharnis, Holland.

No. 5634; April 23, 1917. Convention date, Nov. 15, 1915.

This invention has for its object to prevent the breaking-off of the nozzles from which are suspended the mantle rings.

The patentee states that he has noticed that the part of the broken nozzle which is left behind is always embedded in a hard deposit formed in the space between the end of the brass burner tube and the nozzle—a deposit that makes it impossible to remove the remaining part of the nozzle by unscrewing, so that the removal can only be effected by breaking. He found that the deposit (which is soluble in water), after cooling down, gradually assumes a blue colour in contact with the air, as it contains copper sulphate and zinc sulphate, formed in those places where the flame comes into contact with the outside of the burner tube; while streaks of a white substance are also found there which, on cooling, gradually assume a light blue colour in contact with the air. The inventor concluded that the deposit is caused by the reaction of the sulphur-containing gases of the flame on the metal of the burner tube—a damage which can be avoided by preventing the reaction. So he proposes to provide the lower screw-threaded part of the burner tube with a brass burner tube and a magnesia nozzle connected to each other by inter-engaging screw threads, either protected or made of such material that a deposit of sulphate of zinc and sulphate of copper cannot be formed on the screw threads of the burner tube.

Two methods of carrying out the invention are possible: (1) The nozzle and burner tube may be connected to each other by screw threads with a suitable cement interposed between. (2) The screw-threaded end of the metal burner tube may be made of (or covered with) a material other than brass—either a metal or a non-metallic material.

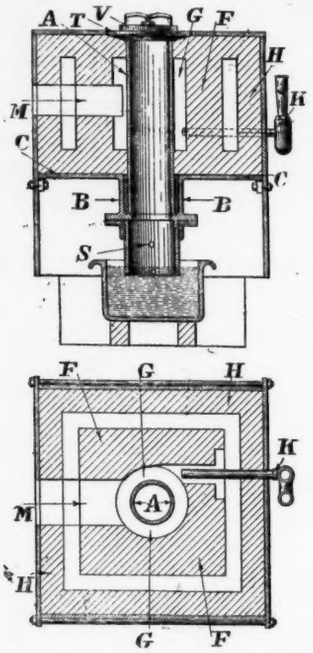
Numerous substances and materials may be employed for the lute or for covering the end of the burner tube—for example: The lute may consist of powdered asbestos, aluminium powder, and water glass in suitable proportions; but lutes in which clay, china clay, magnesia, chamotte, or the like form part of the composition will also be suitable. The screw-threaded part of the burner tube may be plated nickel, nickel alloy, or silver; and when the screw-threaded part of the tube is separate from the rest of the tube, a variety of materials (metallic and non-metallic) may be employed—for example, silver, nickel, earthenware, or moulded silica.

Furnaces for the Heat-Treatment of Metals. No. 117,903.

ROGERS, Sir HALLEWELL, of Edgbaston, Birmingham, and WALTER, C. M., of Four Oaks, near Birmingham.

No. 11,225; Aug. 9, 1916.

This invention comprises the combination of a vertical refractory retort tube, closed at its upper end with a removable closure device, and having a portion for heating by radiation from its walls the articles under treatment, and means for suspending them from or through the closure device so as to be clear of the walls. There is an enclosed continuation or extension of the retort tube leading to, and dipping in, a bath of oil, water, or other liquid, so as to be effectively sealed therein, with an inlet in it by means of which the whole retort tube is charged with an inert gas or vapour or with a carburizing medium as desired.



Hallewell-Rogers and Walter's Furnace for Heating Metals.

A vertical section is given of a furnace suitable for the heat treatment of small articles, with a sectional plan.

The retort tube A is cylindrical, and is seated in a socket portion B of a bottom plate C secured to the outer casing or walls. The lining around the retort tube is here shown as a central structure F, providing the combustion space G around the retort and separated from the refractory lining H of the casing by a space packed with antithermic or isolating material. Through F at one side is an opening leading to the combustion space for a burner tube K, and on the other side at M is the outlet flue.

The retort tube, continued below the plate C, is sealed in a bath of oil, water, or other liquid, which, in hardening operations, will serve as the quenching medium. For this purpose the socket B may be flanged and a wrought-iron pipe O be detachably secured to it to form the continuation which leads from the retort portion proper to a quenching bath, so that no oxidation can take place as the articles are lowered out of the retort part of the tube.

An inlet S (preferably immediately above the bath) leads into the tube retort, so that it may be charged with an inert gas—say, town gas. But, if desired, any suitable carburizing medium may be introduced into the retort—such as town gas which has been brought into contact with ammonia vapour or a suitable hydrocarbon. The articles under treatment are suspended in the retort tube in any convenient manner which will keep them out of contact with the walls—for example, in a basket of hard wire or of refractory material suspended by wires through an aperture in the cover plate V at the top.

Recovering Cyanogen-Bearing Compounds from Gases obtained from Carbonaceous Fuel. No. 109,254.

ESPENHAHN, E. V., of Brighton, Victoria, Australia.

No. 10,703; July 25, 1917. Convention date, Aug. 8, 1916.

This invention refers more especially to the treatment of heating and illuminating gases containing cyanogen-bearing compounds obtained from the distillation of coal in ordinary gas-works or from the manufacture of coke in coke-ovens. The invention is also applicable to other gases which contain cyanogen-bearing compounds—such as producer gas and blast-furnace gases.

By way of example, the patentee describes the treatment of ordinary coke-oven gases, in which the recovery of the cyanogen bearing compounds is effected before the removal of the ammonia. The gases are first treated in the ordinary washers for the removal of tar fog, and (without cooling) are led into washers, preferably of the centrifugal type, at a temperature of approximately the dew-point of the gases—*i.e.*, from 40° to 90° C.; and while still at this temperature they are brought into intimate contact with a washing liquor, consisting of a concentrated solution of sodium carbonate in which ferrous sulphide is held in suspension. The concentration of the solution is obtained by adding the requisite quantity of such reagent (as calculated) to obtain subsequently a concentrated solution of sodium carbonate and sodium ferrocyanide. He has found that a solution made up by dissolving 4 lbs. of dehydrated sodium carbonate per gallon of water answers the purpose. In practice, preferably two or more separate tanks or containers of this washing liquor are maintained, so that as one is being withdrawn the other is in circulation. The gases are caused to pass through the liquor while it is maintained in a constant state of agitation by the centrifugal action of the washer. The temperature is maintained at or about the dew-point of the gases by the admission of steam or other heating medium as found necessary. In practice, ferrous sulphide (or its equivalent) may be added from time to time to maintain the reaction which is in accordance with the equation:

$$FeS + 2Na_2CO_3 + 6HCN = Na_4Fe(CN)_6 + H_2S + 2H_2O + 2CO_2.$$

When the liquor contained in one storage tank has become sufficiently charged with sodium ferrocyanide, the liquor contained in the second tank is bye-passed into the first washer, the first mentioned liquor is withdrawn, and the sludge separated from the clear liquor by filter pressing or the like. The clear liquor is then allowed to cool, when pure crystals of sodium ferrocyanide are formed. The clear liquor is returned to the washing storage tank after having been renewed by the addition of sodium carbonate and ferrous sulphide. The sodium ferrocyanide thus obtained is treated with sulphuric acid for the formation of hydrocyanic acid (and subsequently alkaline cyanides) in accordance with the equation:

$$2Na_4Fe(CN)_6 + 3H_2SO_4 = Na_2FeFe(CN)_6 + 6HCN + 3Na_2SO_4.$$

The hydrocyanic acid thus formed is used for producing alkaline cyanides in known manner. The sodium ferrous ferrocyanide sludge formed in this way may be used with sodium carbonate for washing the crude gases when sodium ferrocyanide is regained and ferrous sulphide formed in accordance with the equation:

$$Na_2FeFe(CN)_6 + H_2S + Na_2CO_3 = Na_4Fe(CN)_6 + FeS + CO_2 + H_2O.$$

The ferrous sulphide formed as above with sodium carbonate reacts upon the gases as previously described for the formation of sodium ferrocyanide.

The gases after the removal of the cyanogen-bearing compounds are caused to travel to ammonia saturators, in which they are subjected to the action of sulphuric acid in the ordinary way for the formation of ammonium sulphate. Or, alternatively, the gases, or a portion of them, may be passed through a solution of ferrous sulphate for the formation of ammonium sulphate free from cyanogen-bearing compounds and ferrous sulphide in accordance with the equation:

$$FeSO_4 + H_2S + 2NH_3 = (NH_4)_2SO_4 + FeS.$$

The ferrous sulphide thus obtained may be used in conjunction with sodium carbonate for washing the crude gases in the first operation for the formation of sodium ferrocyanide.

Another example of the invention consists of its application to the treatment of gases in which the cyanogen-bearing compounds are recovered after the removal of the ammonia. In this case, the gases are treated in the ordinary way for the removal of the tar fog and ammonia, and are then subjected to a washing treatment at a relatively high temperature (approximately the dew-point of the gases) with a concentrated solution of sodium carbonate in which ferrous sulphide or sodium ferrous ferrocyanide obtained by subsequent operations is held in suspension. The same reactions take place as above described, producing sodium ferrocyanide in solution. The liquors are treated for the separation of the sludge, and the clear solution is allowed to cool for the precipitation of crystals of pure sodium ferrocyanide. This sodium ferrocyanide is treated with sulphuric acid for the formation of hydrocyanic acid, and subsequently alkaline cyanides, while the sodium ferrous ferrocyanide formed is used with the concentrated solution of sodium carbonate for treating fresh supplies of the gases for the formation of sodium ferrocyanide as previously described.

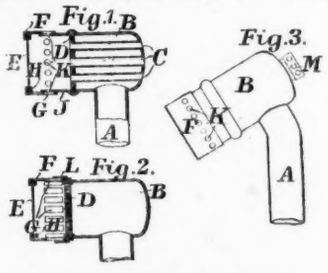
A certain portion of the gases, before being led into the ammonia saturators, is bye-passed into another washer, where the gases containing ammonia and sulphuretted hydrogen are caused to pass through a solution of ferrous sulphate for the formation of ammonium sulphate and ferrous sulphide, which may be used in the first operation for treating fresh gases with a concentrated solution of sodium carbonate for the formation of sodium ferrocyanide.

Gas-Burners.—No. 117,905.

HELPS, GEORGE, of Nuneaton.

No. 392; Jan. 9, 1917.

In this invention the burner tube terminates in a chamber which carries the burner head, and the chamber is provided with an extension closed except for an adjustable inlet for secondary air and the holes of a disc mantle carried by the extension. Preferably the mantle



Helps's Adjustable Gas-Burner.

carrier forming the extension is capable of movement, so that its position with respect to the burner head is adjustable, while the chamber is preferably at an angle to the burner tube.

In fig. 1, A is the burner tube; B, the chamber carried by it; D, the burner head; while J is an extension of the chamber over which fits a

ring F carrying the mantle E. The extension and the carrier are perforated at K and G, so that an adjustable supply of secondary air is admitted to the space formed by the extension. C are tubes for providing an unalterable supply of secondary air, to such space.

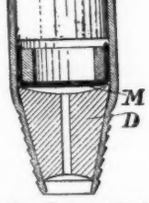
In the burner illustrated in fig. 2 there are no tubes C; and the mantle carrier F itself forms the extension of the chamber B. The secondary air adjustment is obtained by sliding a ring L to and fro, and so more or less blocking the slots F.

Fig. 3 shows a burner set at an angle in which the secondary air is supplied from a pipe fitted with an adjustable cap M, and which passes through the chamber.

Gas-Burners.—No. 117,962.

BRAY, A., and GEO. BRAY & CO., LTD., of Leeds.
No. 11,724; Aug. 15, 1917.

This invention relates to flat-flame gas-burners; the object being to provide means for securing uniformity of flow of gas through the upper part of the body, "securing greater freedom from hissing which may be due to slight pulsations in the pressure and velocity of the gas in the upper part of the burner." This is attained by making a diminisher having a bore considerably longer than its diameter, "giving increased resistance to flow, and adapted for location mainly in the lower tapered end of the body."



Bray's Gas-Burner Diminisher.

For the English type burners (having an outside taper screw), the diminisher D is tapered, and fits into the taper part of the burner socket and projects above the bottom of the tubular body of the burner. Three or four discs of muslin M are fastened above, and in contact with, the upper end of the diminisher by one ring of zinc. The folded edges of the discs fit tightly inside the tubular body, near the lower end of the cylindrical part thereof—thus preventing the passage of any gas except through the meshes of the muslin. The bore of the diminisher is reduced in diameter as compared with that required hitherto, and is made longer, so as to increase the throttling or steadying action of the diminisher, which allows a smaller number of muslins and their holding rings to be used, and consequently enables the length of the expansion chamber between the diminisher and the tip to be reduced.

Furnaces.—No. 117,923.

IONIDES, A. C., JUN., of Porchester Terrace, W.
No. 9893; July 9, 1917.

This invention relates to the methods of combustion described in patent No. 15,455 of 1909—furnaces in which a high temperature is maintained by the combustion of a mixture (say) of gas and air, preferably in approximately the exact proportions for complete combustion without substantial residue of the constituents of combustion as set forth in the patentee's earlier applications—No. 23,350 of 1913, No. 26,259 of 1913, No. 108,701, and others.

The invention consists in a method of preventing back-firing in such furnaces by reducing the radiating capacity of the furnace wall or side opposite to the burner nozzle or inlet orifice by hindering the displacement of a layer or stratum of fluid from an area against which a burning jet is directed. The invention further consists in a furnace in which one or more recesses, cavities, or pockets are formed in the furnace wall opposite to the jet of incoming mixture in order to provide an area of reduced radiating capacity for preventing back-firing.

Lighting of Kingstown.—The Kingstown Urban Council referred to the Finance Committee, giving full powers, a report from the Surveyor with reference to the public lighting contract, in which it was suggested that, bearing in mind the restrictions in force, the Council had not the amount of light in proportion to cost, and that while the present military arrangements obtained in the district the correct course would be to cease all public lighting.

A Smaller Output of Coal.—The Coal Controller has issued figures which show a serious falling-off in the estimated output of coal during the first 32 weeks of this year, compared with the output during the corresponding period of last year. The net deficiency is nearly 13½ million tons, or about 8·7 p.ct.; the figures being: 140,958,200 tons for 1918, and 154,450,300 tons for 1917. In the four weeks ended Aug. 17, there were 1,714,800 tons less than in the corresponding period of last year.

Economy Urged at Morley.—The Morley Town Council, on the recommendation of the Gas Committee, have decided to issue a circular to the public, pointing out the difficulty of maintaining gas and electricity supplies owing to the coal situation, urging the greatest economy, and asking the people to have all lights out not later than 10 p.m. It was resolved to ask clubs to reduce their consumption by at least 50 p.ct., and the clergy and ministers to economize and use the schoolrooms for all services, so as to avoid the heating and lighting of two buildings at each church or chapel.

MISCELLANEOUS NEWS.

RICHMOND (SURREY) GAS COMPANY.

The Late Engineer and Secretary.

Sympathetic reference was made at the half-yearly meeting of the Richmond Gas Company, by the Chairman (Mr. Henry Pullman), to the late Engineer and Secretary. The appointment of Mr. E. G. Hutchinson to succeed Mr. Thomas May as Engineer and Manager, has already been recorded.

The CHAIRMAN, on rising to address the shareholders, said: Before commencing our proceedings, it is my melancholy duty to confirm the painful intimation, referred to in the report, of the great and irreparable loss sustained by the Company through the recent death—with tragic suddenness—of its Engineer and Secretary, Mr. Thomas May. Words fail me to adequately express the high appreciation of the long and faithful services of our valued friend and colleague, extending over a period of 35 years; but, speaking as one who enjoyed the privilege of his close and intimate friendship for the past quarter-of-a-century, I share the conviction of a large number of the community, that the world is distinctly poorer by the loss of such a kind, genial, true, and faithful friend—whom as we respected and revered living, so shall we ever mourn him dead. It will be but voicing your sentiments, I feel confident, that an expression of deepest sympathy be conveyed from this meeting to his bereaved widow and family—in which expression, I am sure, you will readily aquiesce, in the manner usually adopted on similar mournful occasions.

Proceeding, he explained a few of the difficulties with which the Directors had had to contend during the period under review, necessitating, for the first time in the annals of the Company, the declaration of a reduced dividend. He said the balance of the revenue account, after allowing for the fixed charges, was £3978. It was proposed to pay a dividend at the rate of 4½ p.ct. per annum, which would absorb £3853, leaving a small balance of £125 to carry forward, in addition to the divisible profits brought forward from the last account. As to the future, with constantly increasing expenses, the Board had had to budget for larger figures; and therefore they had reluctantly had to increase the price of gas 6d. per 1000 c.ft. This advance would necessitate a reduction of dividend, under the sliding-scale, and thus increase the hardships the stockholders were called upon to bear as the result of the war. Of course, they were all aware that there was a war on, and that they ought to bear, without grumbling, conditions which would be resented under other circumstances. Still, he did think the Government had not shown proper consideration to an industry which, to say the least, was as important as any in the country, and but for which the war could not have been continued for six months. The sliding-scale, about which they had all heard so much during the last few weeks, was working unfairly towards those who had supported the industry financially. War conditions had altered the usual balance of supply and demand, with the result that the cost of everything to be purchased had enormously increased. As a consequence, the price of gas had had to be advanced; and, under the sliding-scale provisions, the dividend had had to be decreased. Now, seeing that the profits in almost every industry which had been of utility to the war, had enormously increased, shareholders in gas companies could not be considered greedy, or profiteering, when only asking for protection from a decrease in dividend. The Government were persuaded to bring forward a Bill, which was ultimately altered to provide that the dividend should not fall below three-quarters of the standard or pre-war rate. This was a poor reward for all the industry had done for the country. He did not think that he need fear contradiction when he said the Company had done their part in the work that had to be done in the great war.

HORNSEY GAS COMPANY.

A Short-Lived Strike.

The Half-Yearly Ordinary General Meeting of the Company was held on Friday, at No. 5, Great Winchester Street, E.C.—Mr. A. M. PADDON (the Chairman) presiding.

The SECRETARY (Mr. W. E. Roberts) read the notice convening the meeting; and the report and accounts were taken as read.

THE CHAIRMAN'S STATEMENT.

The CHAIRMAN remarked that in the report itself there were three points calling for attention as of comparative importance. The first was the information that there had been a diminution in the output of gas equivalent to 3·97 p.ct. This figure was of particular significance having regard to the fact that they were now entering upon a period in which the supply of gas would be arbitrarily limited by the Government to a very severe and exacting extent. He need not tell them that a curtailment of the scope of the Company's operations at this time must re-act in an important degree upon the accounts. It was difficult to forecast the extent to which the revenue account would be qualified by any such reduction in business as that with which they were threatened.

DIVIDENDS AND GAS PRICES.

The next point was that they were distributing dividends of 12½ and 9½ p.ct., which were still the highest rates at which the Company had ever so distributed their profits; and this, coming close to the end of the fourth year of the disastrous war, was, he thought, a remarkable achievement on the part of any undertaking such as theirs. It would, however, be seen from the report of the Directors that the price of gas was increased by 2d. per 1000 c.ft. from July last. It was also incumbent upon him to tell the proprietors that this increase, while it satisfied at the moment the prospective demands upon the Company,

could in no way meet the further burden thrown upon them by the increase of 4s. per ton in the price of coal which almost immediately after the close of the half year was announced by the Coal Controller. This would necessitate a further increase of 3d. per 1000 c.ft. from Oct. 1 as a positive minimum in the way of precaution; and this increase would have its effect, of course, upon the dividends of the Company in the future. It was only right that the proprietors should know of this at the earliest possible moment. The standard price which regulated the amount of dividend was 3s. 9d. per 1000 c.ft.; and from this it would be readily understood that the Directors were exempt from any anxiety with regard to the relief, or qualified relief, recently afforded by Parliament to gas undertakings adversely affected by current conditions. Their Company did not come within the category of those whose dividends were likely to be so far reduced as to avail themselves of the mean and inadequate margin of relief which the Government had thought fit to accord in connection with these disabilities. He was therefore absolved from addressing the proprietors on this subject; and he was very glad to be so, because all those involved in the matter had a distinct sense of grievance and discontent with the position as it was and with the measures that were taken to combat it.

POINTS IN THE ACCOUNTS.

Coming to the accounts themselves, the first important figure to which he would draw attention was in the capital account, which showed that the total expenditure to date amounted to £257,796; and this was equivalent to a capital outlay of £463 per million c.ft. of gas sold. It was in this fact that they found most of their security, and all that was favourable in their position to-day. It was this low capital per million c.ft. which brought them through the sea of troubles with comparative success. In the revenue account they would see for the last time the selling price of 2s. 11d. per 1000 c.ft. of gas, upon which all the figures now before them had been based; and it was by this extraordinarily low selling price that these accounts must be gauged as to their respective merits or demerits. On the other side of the account, before approaching the question of profit, he would like the proprietors to notice the figure of £7841, representing the expenditure on repairs and maintenance of the works and plant. Even making allowance for the fact of the reduced purchasing power of money, this sum—which was the equivalent of over 6½d. per 1000 c.ft. of gas—showed that the results, such as they were, had only been reached after what, in even these circumstances, was a proper reservation to establish and maintain the efficiency of the works. The apportionment on behalf of mains and services amounted to 1½d. per 1000 c.ft.; and for repairing, renewing, and refixing meters, to another 1¼d. These were adequate in the circumstances, and showed that nothing had been taken from these items to support the results. But to the minds of some experienced proprietors, the sum set down for repair, maintenance, and renewal of stoves and fittings—amounting, as it did, to less than 1½d. per 1000 c.ft. of gas—might seem, as a matter of comparison, somewhat inadequate. He could assure them, however, that it was quite adequate. Their Company did not embark upon this branch of business until much later than their contemporaries; and so they were in a position to write-down the implements so used at a rate which those who had an accumulation of arrears in such a regard could not do. Their own stocks in this matter had been so qualified by the high rate at which they had amortized them, so to speak, in the past, that this charge of less than 1½d. per 1000 c.ft. was adequate to the fullest possible degree in comparison with the practice of other gas undertakings. The gas unaccounted for was only 5 p.ct., which was a tribute to the good management that pervaded this statement. The total receipts were £2821 less, as recorded at the bottom of the credit side of the revenue account. This was met by a reduced expenditure to the extent of £120, and a reduced profit by £2700 going to the profit and loss account. Supplementing the profit for the half year of £7638 by interest received for cash on deposit, which was in itself a small but very significant detail of the financial margin they possessed, there was a sum of £7732 with which to meet the demands upon them. They required, for income-tax, interest on debenture stock, and the dividend recommended, the sum of £8990; so that there was a deficit of £1258 only as the result of the half-year's operations—a half year in which they had charged the consumers something like 1s. per 1000 c.ft. less than their larger neighbours in the centre of London. Taking into consideration the fact that this profit had been produced, not only at the lowest selling price, but at by far the lowest selling price in the whole of the Metropolitan area, he thought they would agree that it was indicative of successful management and administration. The other items in the accounts were important. The special purposes fund was not so large as he should like to see it; but it was getting on towards £10,000, and was represented by solid investments. The same remark applied to the reserve fund; but in this connection it should be remembered that their carry-forward was over £11,000.

DISTURBED LABOUR CONDITIONS.

These were the domestic matters pertaining to the statement; but the anxieties and difficulties of the administration lay outside the orbit of the domestic conditions, in the general circumstances which affected the Company. To name a few of the problems and difficulties that were before them, he might mention the labour question, the rationing problem, the trouble in obtaining materials and other things which might come upon them at a moment's notice, even as these had done to an extreme degree during the past six months. Most of the proprietors would doubtless have seen in the newspapers a rather highly-coloured statement as to a strike at the works in the current week; but inasmuch as this strike had no existence on Monday morning, and none on Wednesday afternoon, it was at least circumscribed in its extent by time. It was also in its nature, he ventured to think, wholly gratuitous, and simply a repercussion of the general disturbances with which they were all familiar, and which seemed to affect labour in every direction during these unhappy days. It should occasion a thoughtful person no great degree of surprise if there were labour disputes, in view of the fact that the chief police force in the country the other day thought fit to mutiny, and to obtain, in circumstances from all aspects regrettable, a recognition of its conduct and its attitude. When they came to think of it, the only criterion they had for law and order was immediately, and in the ultimate degree, the police force; and if the foundations of order were disturbed, as they were disturbed the other day, how could one possibly expect to maintain order in circumstances where one had least right to expect it? When their own men went out, it was pointed out to them that they were acting in contravention of a very well-known Act—the Conspiracy and Protection of Property Act. Their reply was not an answer, but a question. They asked, "What notice did the police give?" He thought there was so much cogency in this inquiry, that he was glad it did not fall to his lot to answer it. When they were committed to a strike, the men were asked, "What are you striking for?" They, however, declined to say. It was a very difficult thing to deal with a dispute when one's opponent would not even state what his point of view was. Well, just from these few facts the proprietors would see how extremely difficult the position of the Company was. Theirs was a very simple case—"If you have anything whatever to complain about, we will refer it to the Government to settle; and whatever they say, we will do. We raise no difficulties; we raise no objections. We place the matter unreservedly in the hands of a competent and independent authority, and will abide by what they say." But if people would not accept a proposition of this kind, what more could reasonable men do to meet such difficulties? What he had said would give the proprietors some idea of the difficulties to be met in regard to labour. He would like to add that the Hornsey Company always paid their men full, and more than full, contemporary rates for their labour. They had invariably met the men fairly on every question of wages; and the increases they had received since the beginning of the war must in all cases have been over the average increase in the Metropolitan area. It was necessary for him to have said this much, to satisfy the proprietors that in the protection of their interests the Directors were reasonable, and so far as possible vigilant and just in all their dealings with the workpeople. One of the greatest menaces immediately before them was the possible effect of the Rationing Order in the curtailment of their output. None of them knew to what extent it would affect them; but it constituted a very great danger. He did not think the Government themselves altogether realized the extent to which this Order would affect the use of gas. It made the position of gas companies extremely difficult, in having to adapt their business to this very large unknown quantity of finance. A good many people in connection with gas undertakings were doubtless saying, "Surely, the day has come when you ought to deal with your reserves." But he ventured to think it had been a wise and a fortunate policy which had led gas administrators up to this time to refrain from touching any form of financial reserve. The days before them would, he believed, be as bad as, and possibly worse than, those that lay behind them; and when a company had to raise capital or obtain money in some way or another for re-organization purposes after the war, a depleted reserve or the absence of the reserve which the public had been accustomed to in connection with accounts of this kind, would add immensely to their task. For this alone, he thought the wise policy would be to preserve the reserves intact until the last possible moment that they could do so. In conclusion, he moved the adoption of the report and accounts.

The DEPUTY-CHAIRMAN (Mr. A. F. Phillips) seconded the resolution, which was at once unanimously passed.

THE DIVIDENDS.

Proposed by the CHAIRMAN, and seconded by Mr. G. W. CAREY, it was agreed that the sum of £1645 16s., less income-tax, for the payment of the half-year's interest on £65,832 5 p.ct. stock, be set apart, and that a dividend at the rate of 12½ p.ct. per annum on the "A" stock and 9½ p.ct. per annum on the consolidated stock, for the half year, subject to income-tax, be declared.

GOOD SERVICES ACKNOWLEDGED.

The CHAIRMAN then moved a vote of thanks to the executive officers of the Company; remarking that he might be said to have done so already in the comments he had made, for almost everything he had stated was a tribute to the skill, the perseverance, and latterly the marked courage of their Engineer and Manager, Mr. Buckley. The proprietors would have inferred what he had had to go through recently in the way of anxiety and difficulty, and how unjustifiable the demands made upon him had been in their nature and in their incidence at this particular time. One would have thought that through every portion of the body politic there would have been a recognized idea that these were not days in which they should make trouble for each other; but this view was not general, and those who had responsible duties to perform found their burdens immensely added to, when they should have been lightened. Mr. Buckley could claim that he was the premier gas maker and seller in London to-day, and it would be hard to dispute the facts. But he was modest. It was, however, in connection with his administration that they had the most confidence in the future. In the first place, there was at the Hornsey Gas-Works as modern a plant as any he (the speaker) was conversant with. There was no form of gas manufacture there in which the very latest appliances were not employed; and the plant was well maintained, and possessed a considerable margin for the future. As to the Secretary, who had his own troubles, he was a most loyal worker in the interests of the undertaking.

Mr. JOSEPH CASH, in seconding, said he could not help thinking there must be an end presently to these labour troubles. The Government had contributed very largely to them by the high rates they had paid for employment on munition and other work; and in time they must say, "We have given to labour everything it is entitled to, and everything we can give; and therefore we will fix a definite rate at which labour shall be employed, and go no further." Then there would be more peace in the labour world.

The vote having been cordially passed by the meeting,

Mr. BUCKLEY, in acknowledgment, said he felt very grateful to the Chairman for his kind words, and to the shareholders for the way in which they had received the vote. As to the strike, the terms on

which it was settled were the terms of the Company. When they saw the men were ready to cave in, they allowed them to return to work.

The meeting concluded with a vote of thanks to the Chairman and Directors, upon the proposition of Mr. W. D. OVENS, seconded by Mr. M'KAY.

HARROW AND STANMORE GAS COMPANY.

Congratulation upon the Accounts.

The Half-Yearly Meeting of the Company was held on Monday of last week, at No. 5, Great Winchester Street, E.C.—Mr. ARTHUR F. PHILLIPS (the Chairman) presiding.

The ENGINEER and SECRETARY (Mr. Charles Chambers) read the notice convening the meeting; and the Directors' report and the statement of accounts were taken as read.

The CHAIRMAN said that from the capital account it would be seen there had only been an addition of £752; whereas the deductions for depreciation amounted to £2906, reducing the capital expenditure by £2154. This was following the policy which the Board had adopted for some time of getting the capital down. It now stood at £596 per million c.ft. of gas sold. In the revenue account, as might be expected, coal showed a considerable increase, from £14,244, in the corresponding previous half year, to £17,407 for the past half year. This was due to 1297 tons more having been carbonized, and to the increase in its cost. Wages had gone up from £1219 to £2122. Repairs of works were £935 less; but on mains and services there was an increase in the expenditure of £1965—considerable work having been done in enlarging some of the mains to improve the supply of gas to Hendon. There had been no expenditure on prepayment supplies, which in the previous year took £493. The amount carried to the credit of the benefit fund account was £193 less. As evidence of the serious effect of the increased cost of coal and wages, he might say that the cost of the coal and wages, less residuals, was nearly 5d. per 1000 c.ft. more than in the previous year. Since the termination of the past half year, there had been a further advance of 4s. per ton in the price of coal, and additions to the wages, to meet which the Directors had no alternative to increasing the price of gas 4d. per 1000 c.ft. from Midsummer last, making the price 3s. 8d., which might be considered reasonable, as prices went to-day, and was much below that of the companies adjoining the Harrow district. The gas sold was 208 million c.ft., which was an increase of 5·77 p.ct. on the previous corresponding half year, notwithstanding that the Company gave notice to the consumers at Lady-day that they were required to reduce their consumption by one-sixth, to comply with the Government Order. The gas rental showed an increase of £2529; the price being the same. Residuals realized £1115 more. The resulting profit was £9242, which was £411 less than for the corresponding previous half year. What the effect of the new Fuel and Lighting Order might be, it was impossible to predict. There was so far no sign of any reduction in the output of gas in the Company's district. Though the consumption of coal must be reduced, there would be great difficulty in carrying out the provisions of the Order. Adding £4352, the balance brought from the previous half year, to the £9242 profit for the past half year, and deducting £2250 for interest on debentures and income-tax, there remained available £11,443. The proposed dividend would require £6772, leaving £4670 to carry forward. Gas companies had had exceedingly anxious times. There had been continual increases in the cost of coal and all other material required for carrying on the business; and the demands of labour became more and more serious. There had been the two Orders made by the Board of Trade with a view of reducing the consumption of gas, and there had been the consideration by Parliament of the BBill for giving relief to those companies that might be seriously affected by having to raise the price of gas to meet the ever-increasing costs they had to bear. This all caused anxiety to those responsible for the administration of gas undertakings. It was impossible to foresee what the future might have in store for them; but the proprietors of the Company might congratulate themselves upon the satisfactory statement of accounts for the past half year, and (unless anything unlooked for happened) view the future with reasonable satisfaction. He was at the Harrow Gas-Works quite recently, and found their condition satisfactory, and equal to meeting all demands likely to be made upon them during the coming winter. The plant, however, would be fully employed, and it required attention on the part of those in charge to keep everything in an efficient condition. Since 1914, there had been a considerable increase in the consumption of gas, and beyond one purifier now in course of erection no extensions had been made. He was favourably impressed with the female labour employed on the works. The women were carrying on satisfactorily the duties allotted to them, and appeared contented with their work. They were replacing men called up for military service. All appreciated the way in which women had come forward, and hoped they had been inspired with a desire to help their country and to win the war—realizing that their very existence depended upon it. Let the women ever keep in mind the shameful way the Germans treated the women and children in Belgium, and remember that their fate might be the same, unless the Germans were defeated. He alluded to this because there had, speaking generally, been an unfortunate amount of unrest recently among some of the women. By all means let them be properly remunerated for their services; but he would be sorry to see them become agitators. In conclusion, he moved that the report and accounts be adopted.

The VICE-CHAIRMAN (Dr. J. W. Lee Glaisher) seconded the motion.

The CHAIRMAN, in reply to a question as to the "war service payments reserved," said these payments had been reserved for those of their staff and others who had been called up for military service. The Directors apportioned a certain amount every week for them.

The resolution was then carried unanimously.

On the proposition of the CHAIRMAN, seconded by Mr. SAMUEL CUTLER, dividends were declared for the half year at the rates of 5½ p.ct. per annum on the 5 p.ct. ordinary stock and 5 p.ct. per annum on the 5 p.ct. preference stock—both less income-tax.

The CHAIRMAN said that one other duty remained to him, and this was to propose a vote of thanks to their excellent Secretary and Engineer, Mr. Chambers, the staff of the Company, and all the employees, for the services they had rendered during the past half year. They had had many difficulties to contend with. It was not easy to keep up the stock of coal and to obtain the other materials required; and there was always the labour question. But the whole of the staff had carried on the business well; and the result was the satisfactory balance-sheet that had been submitted to the proprietors.

Mr. A. M. PADDON, in seconding the vote, said there would be a great unwritten chapter after the war was over, relating to the devoted efforts of executive officers of gas companies which had never been disclosed in the accounts or by any other method. The proprietors would pass the vote all the more readily if they knew the details of the services that had been rendered. Of course, the incidence of these difficulties was much greater in some cases than in others; and he was not going to say that the suburban companies in the north of London had the heaviest part of them; but anything that happened in the central part of London with regard to labour disturbances or shortness of supplies reacted immediately on the smaller undertakings in the north. The labour difficulties were general; but it was naturally more difficult to meet them in the case of a small company than in that of a large one.

Mr. CHAMBERS, in acknowledging the vote (which was heartily accorded), said the results of the past half year were very gratifying to him and to those associated with him. The dividend was not reduced; and the employees were all well paid.

Mr. F. R. SMITH, who proposed a vote of thanks to the Chairman and Directors, said that, to his mind, the most satisfactory item of a satisfactory balance-sheet was the reduction of the capital. Some of them could remember when the capital account of the Company stood at a very different figure; and he thought it was largely due to their Chairman that the capital expenditure had been reduced until it now stood at the satisfactory figure of £590 per million c.ft.

Mr. J. W. BUCKLEY, in seconding, remarked that the consumers were undoubtedly well pleased with the price of gas; and they, as shareholders, were quite satisfied with their dividend.

The CHAIRMAN'S acknowledgment brought the meeting to a close.

THE NEW GAS-WORKS SCHEME FOR POOLE.

Poole Corporation and Plans for Economical Gas Production.

The Bournemouth Gas and Water Company have on hand an important and far-reaching scheme of development in Poole, where their extensive works are situated. The Company's output of gas has risen from 230 million c.ft. in 1897, to 1260 millions last year; and in the borough of Poole alone the increase since 1901 had been from 36 million c.ft. to 224 millions. This advance renders imperative an enlargement of the works, as the population in Poole itself has risen in one decade by 10,000, and now stands at well over 40,000. Arising out of the general growth of the district, and the extended use by the public of gas for lighting, cooking, and heating, the Company (the Acting Manager, Mr. Philip G. Moon, pointed out to a correspondent of the "JOURNAL"), desire powers to considerably add to their production plant. The scheme—an after-war one—involves the promotion of a Bill in the ensuing session of Parliament, the main features of which will be (*a*) to repeal the restriction imposed on them by the Act of 1903, so as to enable them to erect retorts and manufacture gas on the Pitwines, and (*b*) to construct an overhead wire-rope conveyor or cableway for the purpose of transporting coal from their premises on the quay to the Pitwines.

The Company in due course inquired what attitude the Poole Corporation would assume to such proposals; and a Sub-Committee which had met Mr. W. Cash, Colonel Morgan, and Sir Charles Jessel (three of the Directors) reported to the Town Council meeting last Tuesday having come to the conclusion that the scheme would be detrimental to the interests of the town. They recommended the Corporation to state their decision to strenuously oppose the Bill, if brought forward. The Finance Committee had approved the report; and at the Council meeting, the Chairman (Alderman L. D. Ballard), in moving the adoption of the report, said the Company's idea was to build other houses in lieu of those over which their cable-way would go. When the Committee expressed disapproval, it was pointed out to them that the Company had other land at Beech Hurst (the offices), on which there were no restrictions. The Alderman added that the Committee hoped the Council would unanimously support them in opposition to the project. "To grant permission would be suicidal," he concluded. Mr. Ostler remarked that the gas-works at present were a perfect nuisance in the borough; and if the Council let the Company have more, they would deserve kicking out.

The proposals, which, it was pointed out, would mean a large addition to the retort-houses and works, were criticized by the majority of the members. On the other hand, Mr. W. P. Hunt moved that the Company be informed that the Corporation could not approve of the present scheme. Alderman J. C. Julyan, the Chairman of the Sanitary Committee, in seconding the motion, reminded the Council that the Company were the largest ratepayers in the borough, and the additions would mean a big increase to the rateable value. The amendment, however, failed to receive support; and the Committee's report was carried.

Limerick Gas Workers.—A strike of Limerick gas workers has been satisfactorily settled. When the negotiations on wages had been completed, the men refused assent to the recognition of plenary powers in the Engineer of the gas-works, and a serious situation was threatened. But wiser counsels prevailed, and agreement on the point indicated was arrived at.

NOTTINGHAM'S INCREASED PRICES.

A gloomy prospect as to possible further difficulties in the way of gas supply was foreshadowed at a meeting of the Nottingham City Council on Monday of last week, by Alderman Albert Ball, in presenting a report of the Committee of which he is Chairman, embodying a recommendation as to imposing a further charge of 8d. per 1000 c.ft., making an advance of 1s. since 1910. No objection at all was raised to the increase; but occasion was taken by the Chairman to rebut certain misconceptions to which recent contributions to the local Press had given rise.

Alderman BALL, in support of the suggested increase of price, pointed out the enormous increase which had taken place in regard to the cost of materials compared with the rates prevailing in pre-war times. In 1914, coal cost 11s. a ton, as compared with 24s. 9d. in the present year; and increases in other directions had been equally striking. Stokers' and labourers' wages had risen respectively by 30s. 8d. and 24s. 1d. a week, as compared with 1914; stokers now receiving 73s. 2d. per week, and labourers 51s. 7d. He quoted figures as to advances made in the price of gas in other towns, to prove that Nottingham was by no means the worst off. He thought that, unless something unforeseen occurred, gas profits in Nottingham might be wiped out next year. Owing to the shortage of labour, coal, and other materials, the public should be very thankful if they obtained plenty of light during the coming winter. Personally, he did not think they would be able to keep up the supply. The Committee had used all endeavours possible to secure increased quantities of coal; but up to the present moment they had been unsuccessful.

Mr. H. G. FORD (the Vice-Chairman of the Committee), who directed attention to the fact that the increase of prices in Nottingham was less than that of many other large towns, seconded the adoption of the report, which was agreed to without discussion.

SALFORD GAS UNDERTAKING.

The Bugbear of the Rates.

The chief subject of discussion at the meeting of the Salford Council last Wednesday was the proposal of the Gas Committee to increase the price of gas 10d. per 1000 c.ft. In regard to prepayment meters, it was proposed to reduce the quantity supplied for 1d. from 25 to 20 c.ft.

Alderman F. S. PHILLIPS (the Chairman of the Gas Committee), in moving the resolution, regretted its necessity. By the end of the current financial year, the department would have paid in wages alone an increase of £25,000, even if there were no further advances. For coal the increased payment would be £28,500, for rates and taxes £3200 more, for interest and redemption payments £1800 over last year, and for allowances in respect of men on active service £500 more—a total of £59,000. The sale of residuals would bring this down to £44,680. As the Council knew, the deficit on the gas undertaking at the end of last year was £33,620. Some people thought the undertaking was not a paying concern; but it was. It was, however, under a peculiar Act, which said that, whether the undertaking made it or not, £10,000 a year must be paid in relief of rates, and £2090 to the sinking fund. The undertaking had not been able to make this £12,090, with the result that it incurred a debt. Five years at the rate mentioned meant £60,450. The actual debt, however, was £33,620, which represented the balance the department had not made. The Committee were very unwilling to raise prices; but the longer this was delayed, the more serious the position would become.

Mr. LEES having formally seconded the resolution,

Mr. GREENWOOD protested against so large an increase. He recognized the fact of increased charges for labour, coal, and other items, but contended that there ought to be a larger increase in the income from residuals. The cost of putting gas into the holders in Salford was heavier than it should be. The present position would not be altered until Salford changed its field of coal supply; and though, owing to the war, this could not be done at present, inquiries should be made with a view to its being carried out as soon as possible. The gas undertaking was getting more and more into the mire; and unless something was done, there would be another increase of prices some time next year.

Mr. BRATHERTON, supporting the resolution, described Mr. Greenwood's remarks as veiled attacks on the management. Mr. Greenwood had, he observed, brought the question of residuals before the Committee from time to time; but on every occasion he had proved to be wrong. Compared with the increased cost of other commodities, gas had gone up the least of all in the borough.

Mr. DELVES said an increase of 10d. was a very serious matter for the inhabitants. When gas rose by 1s. 11d. per 1000 c.ft. within four years it was time the Council cried "halt," and made sure that the administration which had brought about such an increase was thoroughly justified in so doing. It was much larger than the increase in Manchester. If things went on like this, the ratepayers would take up the cry of amalgamation with Manchester. He moved, as an amendment, that the resolution be referred back to the Committee for further consideration, and that a Special Committee be formed to investigate the Gas Department.

The MAYOR ruled that the question of a Committee of Inquiry required notice of motion.

Mr. DELVES thereupon simply moved that the resolution be referred back, and Mr. PETER HAMPSON seconded.

Alderman PHILLIPS said he would welcome inquiry into the undertaking, if the Council wanted it.

Upon the division, the amendment was defeated by 25 votes to 14, and the resolution was adopted.

Alderman PHILLIPS stated that they would be extremely fortunate if they were able to maintain the supply of gas throughout the winter, on account of the difficulties in coal supply.

MACCLESFIELD GAS ENGINEER'S REPORT.

Reporting to the Gas Committee of the Macclesfield Borough Council on the working for the year ended March 31, Mr. J. E. Blundell (the Gas Engineer and Manager) says there was an increase in consumption of 9,739,185 c.ft. (5·41 p.ct.) over the preceding year. The quantities of gas made in the two years were: 1917, 197,818,000 c.ft.; 1918, 207,367,000 c.ft.

The gas-making material used was as follows:

	1918. Tons.	1917. Tons.	Decrease. Tons.
Coal	12,915	13,031	116
Oil	—	112	112
Coke	—	254	254

In the past twelve months, the gas made per ton of coal carbonized amounted to 16,056 c.ft., of a gross calorific value of 476 B.Th.U. The quantity sold per ton of material used was 14,679 c.ft.; the unaccounted-for gas being 7·17 p.ct.

The prepayment system of supply now amounts to 33·25 p.ct. of the whole consumption, and shows an increase of 13·3 p.ct. above the previous year. The average price of gas was 2s. 10·4d. per 1000 c.ft. The average consumption per prepayment meter was 11,646 c.ft.

The gross profits of the year amount to £9528; and after paying £3556 towards the interest and sinking fund, there remains a net profit of £5972. It was proposed by the Council that £2972 should be carried to the district fund, and £3000 to the maintenance fund. The net cost of gas per 1000 c.ft. sold (less residuals, cookers and fittings, rents, hire of meters, &c., and adding interest, sinking fund, and plant reconstruction charges) was in 1917 2s. 5·51d., and in 1918 2s. 2·99d.

SUPPLY OF MAN POWER.

Departmental Co-Ordination.

To better co-ordinate the functions of the several Government departments concerned in the regulation and supply of labour, the Ministry of National Service, the Ministry of Labour, and the Ministry of Munitions have agreed to adopt a uniform grouping of counties into administrative districts, as follows:

1. **London and South-Eastern: London (the City and the Metropolitan Police districts), Surrey, Kent, and Sussex.**
2. **South-Western: Cornwall, Devonshire, Somersetshire, Dorsetshire, Hampshire, Wiltshire, and Gloucestershire.**
3. **Eastern: Leicestershire, Rutland, Northamptonshire, Huntingdonshire, Cambridgeshire, Norfolk, Suffolk, Oxfordshire, Buckinghamshire, Berkshire, Bedfordshire, Hertfordshire, and Essex, excluding the portions of the last two counties covered by the Metropolitan Police district.**
4. **West Midlands: Shropshire, Staffordshire, Herefordshire, Worcestershire, and Warwickshire.**
5. **East Central: Yorkshire (less the Cleveland district), Derbyshire (less Glossop and New Mills district), Nottinghamshire, and Lincolnshire.**
6. **North-Western: Lancashire, Cheshire, the Glossop and New Mills district of Derbyshire, and the Isle of Man.**
7. **Northern: Northumberland, Durham, Cumberland, Westmorland, the Cleveland district of Yorkshire, and the town of Berwick-on-Tweed.**
8. **Welsh: Wales and Monmouthshire.**
9. **Scottish: Scotland.**

These districts will, as hitherto, be called "regions" by the Ministry of National Service; but the Ministry of Labour will refer to them as "divisions." The Ministry of Labour's term for the Eastern Region will be "South Midlands and Eastern Division." The headquarters of the Ministry of National Service will be: For London and South-Eastern, Artillery Mansions, Victoria Street, Westminster, S.W.1; Eastern, 80, Westbourne Terrace, Paddington, W.2.

SUCTION GAS SUGGESTED FOR TRAMCARS.

The Edinburgh tramcars are at present drawn by cables; but the lease granted by the Corporation to the Tramway Company expires in June next, and some time ago the Corporation obtained reports by tramway experts. These advised the introduction of the overhead electric system, except in some of the principal streets, where the wires were recommended to be laid underground. The authorities, however, refused to give their consent to any change of system at the present time; and so the experts' reports were put away until a more fitting season.

In the interval, a number of suggestions and opinions have been ventilated in the local Press; and in the "Edinburgh Evening Dispatch" of the 2nd inst., an evidently well-informed writer, who conceals his identity under the initials "J. S.," advocates gas as a suitable motive force for the tramcars. "All who are in touch with the important developments in the motor transport work of this country now taking place as a result of the enforced shortage of petrol and its high price are aware," he writes, "that the application of town's gas to such work has come to stay, and that it is the compressed gas system which has the greater future possibilities; the canvas containers being a temporary expedient." He points out, however, that as the compressed gas system necessitates the installation of large compressing plants at the gas-works, to which each car must resort for a refill, there are practical objections to its use for tramcars. He then proceeds to say that the idea of using suction gas for motive power is receiving the close attention of experts; and that if it can be demonstrated that suction gas is the most economical system for commercial vehicles, there can be nothing to prevent the system being applied to cars run on rails. The only stumbling-block he can see is the difficulty of producing a tar-free gas for use in small short-stroke, high-revolution gas-engines similar to petrol engines, but specially arranged for gas. He admits, too, that there are at present difficulties (which some consider insurmountable) in connection with the weight and

dimensions of the generator, and the consequent space needed for such a plant. But in spite of this, he submits that the application of suction gas as a reconstruction scheme for a tramway system like that at Edinburgh is on all points the system to be courted and encouraged, as, granting its possibility, its adaptation is the most direct and involves the least capital outlay, because each car is self-contained in its power, equipment, and control.

Another writer expresses the hope that the suggestions regarding the gas car-propulsion project will be carefully considered on its merits. He says it affords the true solution of the present difficulty. It would give much cheaper working, and do away with the nuisance of the cable conduit, and the disfigurement of the overhead wires. As regards producer gas for motive purposes, he draws attention to an experiment recently made at Johannesburg, where a 40-H.P. car was run 140 miles with producer gas mixed with a gallon of petrol, at a fuel cost of ½d. per mile, as against 2½d. for petrol running. A second test with a Ford car, run with producer gas only, cost ¼d. per mile for fuel. Seeing how successfully gas has been applied to motor buses, he sees no reason, after the initial difficulties have been overcome, why tramcars should not be operated with gas. But it is liquefied gas which this correspondent advocates. He points out that some years ago Mr. John Lathrop Gray successfully introduced liquefied natural gas; that progress has been made in Germany in liquefying coal gas; that, in view of the prize of £1000 offered last July for the best method of liquefying coal gas for motor use, a number of the cleverest brains are hard at work; and that there can be no doubt that the problem will before long be satisfactorily solved. Then a comparatively small drum attached to a car will propel a powerfully engined tram for a long distance.

Dundee Gas-Fitters Cease Work.—An involved situation in connection with the work, wages, and trade organizations of the plumbers and gas-fitters employed by the Dundee Gas Department was revealed at a meeting of the Gas Committee, when it was reported that the operatives associated with the Plumbers' Union had handed in their notices and ceased work, because a 12½ p.ct. advance in wages had not been granted. There are two trade organizations concerned—one being the Plumbers' Union, and the other the Sheet Metal Workers' Union—and while the former claimed a 12½ p.ct. increase, the latter asked for a rise of 2d. per hour. It was stated that hitherto all the men employed are gas-fitters who were ranked as sheet metal workers were paid the standard rate of 1s. 2d. per hour, and that while engaged on plumbers' work they received the standard rate in that trade —namely, 1s. 6d. per hour. The last advance was given in March of this year, when an increase of 2d. per hour was conceded. Ultimately it was agreed not to entertain the Plumbers' Union claim; but, in connection with the Sheet Metal Workers' Union's request, it was decided to grant an increase of 1d. per hour, making the wages per week £3 2s. 6d., or an increase of £1 7s. 1d. since the war.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *Sept.* 9.

In the London tar products market continued activity is displayed in pitch. The position is exceedingly firm; makers calling the price not below 65s. per ton net, which figure is readily obtained. Shipments are now being made regularly. Creosote, tar oils, and tar spirits, remain unchanged at the Government controlled prices. Solvent naphtha is quiet at from 3s. 7½d. to 3s. 10½d. per gallon net, delivered in sellers' drums (returnable). In other products, there is nothing of special interest to record.

Sulphate of ammonia continues in strong demand. The price fixed for the second period September/November now comes into operation —namely, £15 15s. per ton, basis 24½ p.ct. quality, delivered consumers' stations, with 10s. discount to dealers.

Tar Products in the Provinces.

Sept. 9.

The average values for gas-works products during the week were: Gas-works coal tar, 31s. to 35s. Pitch, East Coast, 37s. 6d. to 40s. per ton; West Coast—Manchester 25s. to 30s., Liverpool 25s. to 30s., Clyde 25s. to 30s. nominal. Benzol 90 p.ct., North, 10d. to 11½d.; 50-90 p.ct., naked, North, 1s. 3d. to 1s. 4d. Toluol, naked, North, 2s. 3d. Coal tar crude naphtha in bulk, North, 7¾d. to 8¼d. Solvent naphtha, naked, North, 2s. 7d. to 2s. 8d. Heavy naphtha, North, 2s. 11d. to 3s. Creosote, in bulk, North, 4d. to 4¼d. Heavy oils, in bulk, North, 4¾d. to 5d. Carbolic acid, 60 p.ct. East and West Coasts, 2s. 6d. naked, nominal. Naphthalene salts, £6 to £7, bags included. Anthracene, "A" quality, 4d. to 6d. per unit; "B" quality, 1½d. to 2d.

FROM A MARKET CORRESPONDENT.

Tar Products.

Market conditions remain about the same, and there are only a few trifling price alterations. Pitch continues in good demand on Continental account. Most London makers are easily able to command 57s. 6d. per ton f.o.b.; while a further advance in the near future is thought to be quite likely. There is still plenty of room for improvement in Provincial conditions; and quotations for railway transport difficulties still stand in the way of any great quantities coming forward to London for export. It has not been possible as yet to make satisfactory arrangements for shipping direct from any East Coast port, although a little progress is being made on this line. Concerted action might, and probably would, produce some improvement, which is hardly likely to result while the present method of individual application is continued. Meantime, provincial quotations are not really

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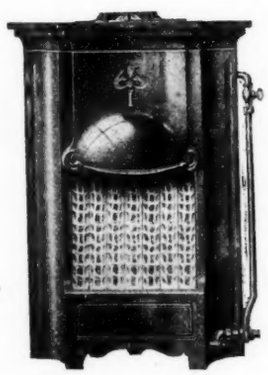

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bad. Solvent naphtha remains distinctly dull when pressed for sale, although a few makers are still able to obtain up to about 3s. 9d. per gallon. An improvement in prices shortly would not be surprising, as a falling off in production is indicated by reports from the works. Heavy naphtha remains in request at late rates. Naphthalene continues unchanged as far as refined is concerned; there being but little demand. Crudes, however, are well supported, and make from £6 10s. to £14 10s. per ton, according to quality. Creosote, toluol, and benzol are nominal; the makes being required for official purposes. The control prices for the latter product still provide the subject-matter of argument in the trade; but here, again, no improvement is likely without united action. It is suggested that 2s. for standard and 2s. 6d. for pure are quite warranted by existing conditions. Even these rates barely cover costs of production, and leave practically no margin of profit. Cresylic acid is obtainable at 3s. 6d., and no change is to be noted in the nominal price for crude 60 p.ct. carbolic acid. Comparatively high prices can still be had for crystals 40 p.ct.; and if export licences continue to be freely available, makers of crude may be expected to agitate for better prices. Aniline oil and anthracenes are without change, and tar in bulk is selling at 4d. per gallon f.o.b.

The range of quotations is as follows:

Benzol: 90% London, 1s. 0½d., North 10½d. to 11½d.; 50% North 1s. 4d. to 1s. 5d. naked per gallon.

Carbolic Acid: 60% East and West Coast 2s. 6d. per gallon; crystals 40% 1s. 2d. per lb.

Crude Tar: London 32s. 6d. to 35s.; Midlands 27s. to 29s.; North 28s. to 30s. per ton *ex* works.

Pitch: London 57s. 6d. f.o.b. works; East Coast, 33s. f.o.b.; West Coast, 32s. to 33s. f.a.s.; Manchester, 32s. 6d. upwards; Clyde 32s. to 33s.; South Wales 42s.

Solvent Naphtha: London 3s. 3d. to 4s.; North and Midlands 3s. to 3s. 6d. per gallon.

Crude Naphtha: Naked 30% 8¼d. to 8½d.; North 6½d. to 6¾d.

Naphthalene: Refined £28 per ton nominal; salts 80s., bags included.

Toluol: Naked, London 2s. 4d.; North 2s. 3d.

Creosote: Nominal, London 4¼d.; North 4d. to 4¼d. (Government price, 75s. per ton f.o.b.—equal to 4½d. per gallon); heavy oil, 4¼d. per gallon in bulk.

Anthracene: "A" quality, 40-45%, 4½d. per unit; "B" quality, 1¾d. to 2¼d.

Cresylic Acid: 95%, 3s. per gallon; 97-99%, 3s. 3d. to 3s. 6d. per gallon, casks included *ex* works London and f.o.b. other ports.

Grease Oils 18° Tw. (naked) £6 per ton f.o.r. makers' works.

Sulphate of Ammonia.

The position here does not improve, and there seems no likelihood of its so doing for some long time to come. The demand this next season is expected to be heavier—increasing quantities being continually taken for munitions and the chemical industry. Supplies do not increase, and cannot be expected to do so in view of restricted coal supplies to both gas concerns and bye-product coke-ovens. Present output from pits is below even summer requirements, and it is thus impossible to accumulate stocks. Men are still being withdrawn from the mines, and the War Office is slow in returning men in accordance with the Government's promise; so that the mines are unable, under present conditions, to relieve the situation. Altogether the situation is somewhat disquieting.

Increases in Gas Prices.

The Burley-in-Wharfedale District Council have advanced the price of gas to 4s. 6d. per 1000 c.ft. through ordinary meters, with 5 p.ct. discount, and to 5s. 2½d. through prepayment meters, with 7d. discount. The Darwen Gas Committee decided at their last meeting to recommend that the price of gas be increased to 4s. 6d. per 1000 c.ft.—an advance of 9d. Owing to the higher costs of coal, labour, and cartage, the Gomersal Gas Company have advanced the price of gas to ordinary consumers by 4d. per 1000 c.ft. as from the end of September. The following is the scale of discounts per 1000 c.ft. on payment of accounts within a month: Under 100,000 c.ft. per annum, 2d.; over 100,000 and under 500,000 c.ft., 4d.; over 500,000 and under 1,000,000 c.ft., 5d.; over 1,000,000 c.ft., 6d. There is to be a charge of 1s. per quarter on prepayment meters. At High Wycombe, the Directors have raised the price of gas 3d. per 1000 c.ft., from July 1. The Kirkburton (near Huddersfield) Gas Company, Ltd., have advanced their charges for gas to the following figures: For lighting, 5s. per 1000 c.ft., subject to 5 p.ct. discount within two months; motive power, heating, and cooking, 4s. 2d., subject to a similar discount; through prepayment meter, 5s. net. The Leeds City Council, at their meeting last Wednesday, approved the Gas Committee's proposal of an increase of 8d. per 1000 c.ft. in the price of gas. It is proposed to increase the price of gas at Lisburn 3d. per 1000 c.ft. The Lymm (Cheshire) District Council have raised prices as follows: Lighting, 4s. 7d. per 1000 c.ft.; engines, 4s. 8d.; cookers, 4s. 2d.; and prepayment meters, 16 c.ft. for 1d., with a discount of 1d. in the shilling. Large consumers are quoted special rates. The Oswaldtwistle Council have approved a suggestion of the Gas Committee that the price be advanced 5d.; the present rate being 3s. 4d. per 1000 c.ft. This is the third increase since the outbreak of war. The charge is subject to a discount of 3d. per 1000 c.ft. There is a scale of reduced prices, according to consumption, for power purposes. The Salford Gas Department recommend the Council to increase the price of gas 10d. per 1000 c.ft., after the reading of the meters for the quarter ending Sept. 30, and to decrease the quantity supplied through prepayment meters from 25 to 20 c.ft. for a penny. The Wallasey Town Council have agreed to a recommendation that the price of gas be increased from 2s. 8d. to 3s. per 1000 c.ft. to ordinary consumers; the increase for power purposes to be equivalent to an addition of 12½ p.ct.

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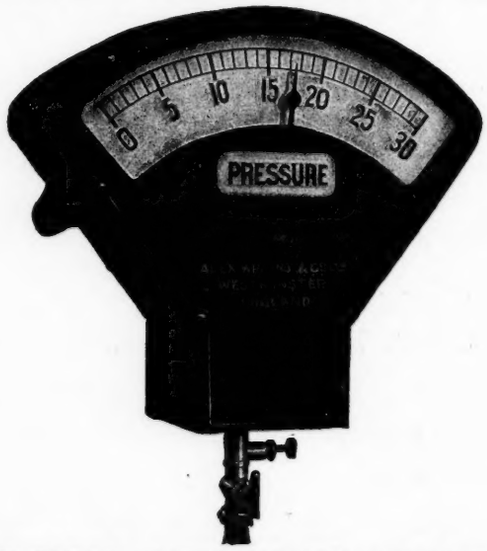

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Dublin Public Bodies and the Gas Company.

The Dublin County Council and the Rathmines and Blackrock Urban Councils have passed resolutions ordering representations to be made to the Board of Trade against the Alliance and Dublin Consumers' Gas Company's proposal to increase the price of gas. At the County Council meeting, Mr. T. Clarke, J.P., said the present gas charges were entirely exorbitant, in view of the bad quality and low pressure, and if any increase were made it would be oppressive. He understood the Alliance Company was practically entirely English now, although the Chairman (Mr. J. Murphy) was an Irishman. He did not object to Englishmen investing money in Ireland if the people got value for what they paid. Mr. Field held that all public utilities should be operated for the good of the community. It was agreed to embody in the resolution suggestions by Messrs. Field and Collins, that all public bodies concerned should come together and make a strong endeavour to have the gas charges reduced, and that, if possible, there should be a public inquiry into the Company's application to the Board of Trade for a modification of the statutory provisions regulating the charges. At the Blackrock Council, Lady Dockrell said any increase in the price of gas would entail great hardship on the poorer classes; and the resolution asked that other Dublin townships should join in the expense of opposition to the Gas Company's proposal.

Darwen Gas Undertaking.

The annual abstract of accounts of the Darwen Corporation, prepared by the Borough Treasurer (Mr. S. Crook), contains a financial *résumé* of the gas undertaking which shows that last year's working resulted in a loss of £940; making, with the war separation allowances paid to the dependants of gas-works' employees serving in the Army, £1059. Compared with the previous year, the deficit is about £173 less. As a result they commenced the current year with an adverse balance of £130. The total consumption of gas during the year was 173,074,300 c.ft.—an increase of over 3¼ million c.ft. The prices of gas were increased twice during the year—4d. per 1000 c.ft. in April, 1917, and 2d. from January, 1918. The actual average net amount realized during the year was 3s. 3d. to 3s. 10d. per 1000 c.ft. Since the close of the year, an additional increase of 3d. per 1000 c.ft. in the prices charged had been made; and a further increase was now contemplated. These increases had arisen in consequence of the raising of the prices of coal, the war bonuses paid to employees, and the general increases in the prices of goods. The following figures showed where increased expenditure occurred last year, and the actual increase in cost above the previous year, per 1000 c.ft. of gas sold: Coal, 0·44d.; manufacture of gas, 1·60d.; distribution charges, 1·11d.; management, 0·27d.; and residuals had produced less by 1·27d. On the other hand, the sales of gas had realized an increase per 1000 c.ft. of 3·62d. The year's working had reduced last year's loss by 0·16d. per 1000 c.ft. There had been carbonized during the year 15,818 tons of coal.

War-Time Conditions at Worthing.

When moving the adoption at the Worthing Gas Company's meeting of the report which was noticed on p. 445 of last week's issue of the "JOURNAL," Mr. H. H. Gardner (the Chairman) said the prospects for the immediate future gave cause for much anxiety. In spite of additional burdens, the Directors were reluctant, in the interests of the shareholders and consumers alike, to further increase the price of gas, and had decided to maintain it at the current rate for the present. They could, however, hardly hope to continue, under these conditions, to earn the full dividend. They might be proud of the fact that their war-time increase in the price of gas was one of the lowest in the kingdom. Whereas before the war their price was considerably higher than in London and the North of England, to-day the gas consumers in the greater part of London and in many of the colliery districts of the North were paying more than those of Worthing. This spoke eloquently of the skilful management of the Company's business. The Directors were carefully watching every point; and in deference to the expressed desire of the Government that work which was not of national importance should so far as possible be avoided, so that the nation's energy might be focussed on the successful and early conclusion of the war, it might be necessary to close-down some of the departments for the time being. Notwithstanding their many difficulties—not the least of which had been the utterly unsuitable quality of coal foisted upon them—they had consistently maintained their statutory obligations with respect of the quality of gas. The future, when the war shall have happily finished, was pregnant with important changes—changes in our national and our business life—which they should be fully prepared for. It was a matter for regret, in his opinion, that the gas industry, large and important as it was, and vital to the national life and interest, was not better organized and represented to watch over its interests. The only organization which it possessed was that of its technical men, who had without doubt done much excellent work and achieved splendid progress in the science of the manufacture and commercial application of gas; but, to his mind, they had not alone sufficient weight to represent the industry in maintaining its proper position in national affairs, and could not without a due representation of the capital side of the industry. A reconstitution on these lines was urgently necessary.

During the hearing of a charge against two Seacombe boys of stone-throwing at street-lamps, the Deputy Town Clerk informed the Wallasey Magistrates that damage to the extent of £1000 had been done to the lamps in the borough by Wallasey boys.

The payment for the past half year of dividends at the rates per annum of 10 p.ct. on the original shares and 7 p.ct. on the additional shares, will leave the High Wycombe Gas Company, Ltd., with a balance to carry forward of £3181, which is some £60 less than was brought into the account.

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Ilford Gas Company.

At the half-yearly meeting, Mr. William Ashmole, the Chairman of the Ilford Gas Company, expressed the gratification of the Board at being able to present the stockholders with so satisfactory a balance-sheet. After providing for interest charges and income-tax, the balance of profit and loss account available for distribution was £19,498, out of which the Directors recommended a dividend for the six months at the rate of 6½ p.ct. per annum on the "A" and "C" stocks, and 4⅝ p.ct. per annum on the "B" stock, less income-tax. These payments would leave a balance to be carried forward of £13,965. The income derived from the sale of gas was based upon a charge of 3s. 9d. per 1000 c.ft.; but the great increase in the cost of coal and wages had again compelled them to give notice of an increase in price to 4s., from the Michaelmas quarter. Every endeavour was being made to keep the Company in the forefront of the industry; and he felt confident they were still in as good a position as any undertaking of their size. Mr. W. B. Farquhar (their Engineer and Manager) had been elected President of the Southern District Association of Gas Engineers and Managers; and no doubt the proprietors would congratulate him upon the honour. The Directors felt sure that his experience and abilities would be of benefit, not only to the Association, but to the industry generally. A stockholder suggested that some means should be adopted of enlightening consumers as to the real operation of the sliding-scale; and the Chairman replied that the idea was a very good one. The matter was being considered by the British Commercial Gas Association; but the Company could themselves, in a very simple statement, assure the consumers that they were not profiteering.

Hastings and St. Leonards Gas Company.

The ordinary general meeting of this Company was held on the 5th inst., the Chairman (Dr. G. G. Gray) presiding. In moving the adoption of the report, the Chairman described the past half year as a more than usually eventful one, and one of the most anxious, trying, and exacting periods. There had been the difficulty of obtaining, and the increased cost of, materials, labour troubles, strikes, threats of strikes, and increased wages; so that it became a matter of surprise and gratification to see what had been the result of the half-year's working. There was a profit balance of £9754—an increase of £1100 over the corresponding half year, and sufficient to meet all charges and the statutory dividends payable and to leave a balance of £1760 to be carried towards the still further increases which had to be made. There was 4s. per ton on the cost of coal, and another additional £2000 on further increased wages. In the receipts they found an increase on the sale of gas of £2483; but this had to be reduced by £161 owing to a fall in residuals, which brought the net increased receipts down to £2322. Small increases and decreases under various heads balanced themselves. The net increase in the Company's expenditure had been £1214; and but for one feature the result of the half-year's working should be considered satisfactory, especially in regard to existing circumstances. Though they had had a large demand, yet they actually had to make and sell less gas. They had made 18,000,000 c.ft. less gas. Therefore, it had been necessary to raise the price, which was then only ½d. in excess of that charged by the Gas Light and Coke Company. In conclusion, the Chairman mentioned that at another meeting a resolution had been carried placing on record the loyal services of Mr. Botley, the Engineer and General Manager. Mr. Botley was so loyal to the Company that he felt it difficult to receive any increase to his salary during the time they were labouring under difficulties, and when the stockholders were receiving small dividends. Mr. A. W. Oke seconded the adoption of the report, which was eventually carried. A special vote of thanks to Mr. Botley for exceptional services was carried—Mr. Botley asking that the matter of remuneration might stand over.

Stanton Ironworks Company, Ltd.—Referring to the recent agreement under which the Stanton Ironworks Company, Ltd., near Nottingham, have absorbed the Holwell Iron Company, Ltd., of Melton Mowbray [*ante*, p. 182], it is stated that the merging of the Holwell interests in the Stanton Company will result in Mr. J. N. Derbyshire and Mr. F. Carbutt (Directors of the Holwell Company) joining the Stanton Board, and Mr. T. Sarson (General Manager of the Holwell Company) becoming General Assistant to the Managing-Director of the Stanton Company, with a seat on the Board as Assistant Managing-Director. Mr. F. Chambers (the Foundry General Manager of the Stanton Company) will join the Stanton Board in charge of the foundries of the two businesses. Mr. C. R. Crompton is the Chairman, and Mr. E. J. Fox the Managing-Director, of the Stanton Company; while Mr. E. Carter (the Secretary of the Holwell Company) will be appointed Secretary to the Stanton Company. The Stanton Company have now an output for cast-iron pipes far in excess of any other foundry in Great Britain; while their capacity for pig iron is in excess of any other producer in the Midlands.

Southgate and District Gas Company.—Compared with the corresponding half of 1917, the sale of gas in the six months ended June 30 last shows an increase of 2·3 p.ct., and the revenue from residuals an increase of £709. The expenditure on revenue account, however, exceeded that for the corresponding period by £1715. In less than twelve months, the authorized charge for coal supplied to the Company has been advanced by no less than 6s. 6d. per ton. Further, the Company have been compelled to again advance the rates of wages paid to their employees; the increase for the half year over the corresponding period of 1917 being upwards of 25 p.ct. In consequence of the enhanced cost of production, the Directors are compelled to give notice of an increase of 8d. per 1000 c.ft. in the charge for gas, to take effect from Michaelmas. After providing for interest and income-tax, there remains a balance of profit of £5601; and at the meeting last week, the Directors recommended the declaration of dividends for the half year at the following rates (less income-tax): On the preference capital, 5 p.ct. per annum; on the original capital, 10 p.ct. per annum; and on the additional capital, 7 p.ct. per annum. This appropriation requires £4325, and leaves a balance of £1276 to be carried forward.

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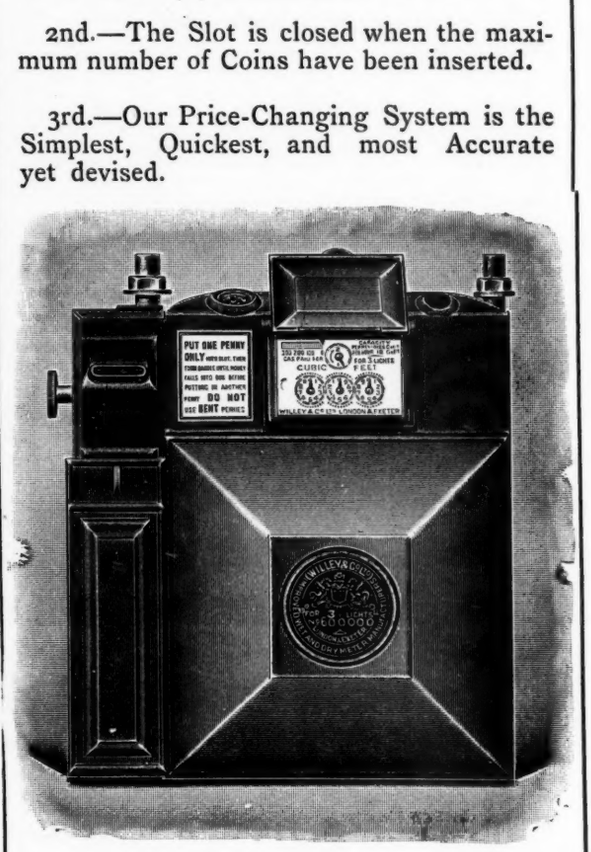

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Centenary Meeting at Oxford.

The principal features of the report for the year ended June of the Oxford Gas Company were reproduced in last week's issue [p. 447]. At the centenary annual meeting, the Chairman (Alderman F. W. Ansell) pointed out that, in order to meet the ever-increasing expenditure, the price of gas—the only item not controlled—had to be increased time after time, with the result that, as the Company were working under the sliding-scale, the dividends were continually decreasing. Before the war the dividends were 8 p.ct., which figure from July last had been reduced to 4 p.ct. Under the so-called "financial relief" granted by Parliament to gas undertakings, the shareholders would have to continue to bear the whole cost of the abnormal increases entirely brought about by the war, until the dividends fell to 3¾ p.ct., when they could apply to the Board of Trade to be enabled to maintain this low rate of interest. The year under review, being the first complete one under their new General Manager and Engineer (Mr. W. E. Caton), had more than exceeded the Directors' most sanguine expectations. Coal had cost only about £4000 more than in 1917, though they had to pay 2s. 6d. per ton advance from September, 1917, or £3500 during the year; whereas the increased revenue from the sale of gas amounted to about £8400—£3200 only of which was due to the increase in price of 4d. per 1000 c.ft. from the Christmas quarter. There had been a saving of about £2700 in purification, due to the use of oxide of iron in place of lime, so as to enable them to comply with the requirements of the Ministry of Munitions. It would be seen from the capital account that the Directors had commenced to depreciate meters and stoves by 10 p.ct. upon the written-down value. The gas sold showed the satisfactory increase of over 10 p.ct.; while the increase in coal used was only 3·4 p.ct.—the unaccounted-for gas having been reduced from 14·6 to 11·2 p.ct. The statutory dividend of 5 p.ct. was declared, leaving £10,022 to be carried forward.

Cork Gas Consumers' Company.—Mr. W. B. Harrington (the Chairman), presiding at the half-yearly meeting, said they were still having a most anxious time with regard to coal supplies, and had practically to take any sort they could get, irrespective of quality. They had given the staff substantial bonuses, and, indeed, had stretched a point in favour of all the employees, though the Company found it no easy matter to make profits in present circumstances. Mr. Sheehan, who proposed the dividend at the rate of 6 p.ct. per annum for the half year, said it was a big reduction from the old dividend of 8 p.ct.; but the shareholders might rest assured that the best possible was being done on their behalf.

STOCK MARKET REPORT.

THE week just concluded on the Stock Exchange witnessed a highly cheerful tone pervading markets in general of all sorts from start to finish. The seasonable drawback of paucity of business was, of course, in full force, and exercised a restraining influence. But the effect produced by the continuous triumphal progress of the Allies was irresistible; and in several of the more important departments the developed strength and rising prices were conspicuous.

The gilt-edged division led the way in the advance. Foremost among the attractions were Consols, which had almost a phenomenal advance, and closed strong on Friday at 58. The 5 p.ct. War Loan rose, then paused while profits were being realized, and again pushed up. Colonials were also in demand.

The Foreign Market presented some strong lines, among which the firmness of French loans was especially noticeable. Russians also were in some favour, despite the internal distractions raging in every quarter of that afflicted land. Belgians, too, were not overlooked. In the Miscellaneous Market, Rubber made some recovery, and Oil did fairly well. Shipping had a big speculative rise, and Meats and Munitions were in request.

Business in the Gas Market was only on a very moderate scale. Had it not been for the two big issues, Gas Light and Coke and Imperial Continental, there would hardly have been any business, so few of the rest were touched at all, even with one solitary bargain. A noteworthy feature was the cessation of Imperial Continental in its upward soaring—realization of profits being sufficient to account for this. It marked from 119 to 116 on Monday, touched 116 on Tuesday and Wednesday, and 113 on Thursday and Friday; the quotation closing at a fall of 5. Continental Union, however, gained 3 on the ordinary and 2 on the preference. Other advances were scored by Gas Light ordinary, Aldershot, Oriental, and Primitiva. Among Provincials, Sheffield *ex div.* and South Shields were rather easier.

Bargains done for cash during the week were as follows: On Monday, Bombay 5⅛, Continental Union 45, 45½, 46, 48, European 11, 11⅛, 11⅓, Gas Light ordinary 64½, 65, ditto preference 68¼, ditto debenture 55⅜, 55⅞, Imperial Continental 116, 116½, 117, 117½, 118, 118½, 119, South Metropolitan 66, 66½. On Tuesday, Bournemouth "B" 10⅜, 10½, Gas Light ordinary 64⅜, 64⅞, 65½, Imperial Continental 116, 116½, 117½, 118. Monte Video 9⅓, South Metropolitan 66. On Wednesday, Gas Light ordinary 65, 65⅛, 65½, Imperial Continental 116, 116⅓, 117, 117¼, Monte Video 9, South Metropolitan 66⅓, Tottenham "B" 64. On Thursday, Brighton and Hove original 135½, Gas Light ordinary 64⅜, 65, 65⅛, Hastings and St. Leonards 50½, Imperial Continental 113, 115, 116, Monte Video 9⅛, Primitiva 34s. 6d., South Metropolitan 65½, 66¼, South Suburban 70½. On Friday, Brighton "C" preference 60, European 11, 11¼, Gas Light ordinary 64½, 65⅛, Imperial Continental 113, 115, Primitiva preference 54s. 6d., Tottenham "B" 64½.

In the Money Market, there was a fair demand which was easily met. The Bank rate is 5 p.ct., as fixed on April 5, 1917.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S BARGAINS.

Issue. £	Share.	When ex-Dividend.	Ante-War Dividend & Bonus p.c.	Last Dividend.	NAME.	Closing Prices. July 30, 1914.	Present Prices.	Lowest and Highest Prices of Bargains.
182,049	Stk.	Mar. 10	4	4%	Aldershot 4 p.c. Pref.	..	55—60*	..
1,551,868	,,	April 8	2½	4⅜%	Alliance & Dublin Ord.	59—64	58—68	..
274,000	,,	July 10	4	4%	Do. 4 p.c. Deb.	76—79	57—62	..
280,000	5	April 29	7½	8%	Bombay, Ltd.	5⅛—5⅜	5—5¼	5⅛
50,000	10	Feb. 26	16	11%	Bournemouth Gas and Water — 10 p.c.	28—30	20—23*	..
888,110	10	,,	7	7%	Bournemouth Gas and Water — B 7 p.c.	15—15½	10—11*	10⅜—10½
116,000	10	,,	6	6/-	Bournemouth Gas and Water — Pref. 6 p.c.	13½—14	9—9½*	..
159,740	—	—	—	4%	Bournemouth Gas and Water — 4 p.c. Deb.	..	66—68	..
992,045	Stk.	Feb. 26	14	4⅜%	Brentford A Consolid.	261—266	73—76	..
784,920	,,	,,	11	4⅜%	Do. B New	204—209	65—68	..
55,000	,,	,,	5	5%	Do. 5 p.c. Pref.	109—111	77—82	..
221,400	,,	June 11	4	4%	Do. 4 p.c. Deb.	91—93	62—64	..
217,880	,,	Feb. 26	11	9%	Brighton & Hove Orig.	208—213	135—140	135½
244,900	,,	,,	8	6%	Do. A Ord. Stk.	154—159	95—100	..
530,000	20	Mar. 26	12½	22/6	British	44—45	30—31	..
120,000	Stk.	June 26	4	4%	Do. 4 p.c. Deb. Stk.	88—90	64—66	..
245,771	,,	—	4	4%	Buenos Aires 4 p.c. Deb.	85—87	50—53	..
100,000	10	—	—	—	CapeTown & Dis., Ltd.	1½—2½	3⅜—4½	..
100,000	10	—	—	4½%	Do. 4½ p.c. Pref.	4—6	7—8	..
100,000	Stk.	June 26	4½	4½%	Do. 4½ p.c. Deb. Stk.	70—75	60—65	..
157,150	,,	Feb. 26	5	5%	Chester 5 p.c. Ord.	108—110	79—81	..
1,513,280	,,	Feb. 12	5/9/4	36/-	Commercial 4 p.c. Stk.	106—108	56—61*	..
560,000	,,	,,	5½	80/-	Do. 3½ p.c. do.	103—105	53—57*	..
475,000	,,	June 11	8	8%	Do. 3 p.c. Deb. Stk.	69½—71½	51—53	..
800,000	,,	,,	4	—	Continental Union Ltd.	76—79	43—48	45—48
200,000	,,	,,	7	—	Do. 7 p.c. Pref.	115—118	65—70	..
278,400	—	—	—	10½%	Croydon B and C 7 p.c.	..	140—150*	..
—	—	—	—	10%	Do. E	..	..	..
492,270	Stk.	—	6	6½%	Derby Con. Stk.	123—125	95—100	..
55,000	,,	—	4	4%	Do. Deb. Stk.	102—104	80—83	..
1,002,180	10	July 29	10	5/0	European, Ltd.	17½—18	10½—11½	11—11½
16,298,975	Stk.	Feb. 10	4/17/4	29/4	Gas Light and Coke — 4 p.c. Ord.	98—102	64—66	64½—65½
2,600,000	,,	,,	3½	3½%	Gas Light and Coke — 3½ p.c. max.	76—79	52—54	..
4,062,235	,,	,,	4	4%	Gas Light and Coke — 4 p.c. Con. Pref.	96—99	66—68	68½
4,674,850	,,	June 11	8	8%	Gas Light and Coke — 3 p.c. Con. Deb.	72½—74½	54—56	55½—55⅞
130,000	,,	,,	10	10%	Gas Light and Coke — 10 p.c. Bonds	..	..	..
258,740	,,	Mar. 12	5	2¾%†	Hastings & St. L. 3½ p.c.	87—89	46—51	50½
70,000	10	April 29	11	6%	Hongkong & China, Ltd.	16½—16⅝	7—8	..
86,600	—	—	—	9½%	Hornsey 7 p.c.	..	115—125	..
181,000	Stk.	Mar. 12	7½	6¼%†	Ilford A and C.	151—154	90—95	..
65,780	,,	,,	6¾	4⅝%†	Do. B	115—118	70—75	..
65,500	,,	June 26	4	4%	Do. 4 p.c. Deb.	92—94	62—65	..
4,940,000	,,	May 14	9	4½%	Imperial Continental	150—160	112—117	118—119
1,285,000	,,	Feb. 12	3½	3½%	Do. 3½ p.c. Deb. Red.	84—86	70—72	..
285,942	,,	Mar. 12	6¾	6¾%	Lea Bridge Ord. 5 p.c.	119—121	92—97	..
2,498,905	,,	Feb. 26	10	5%	Liverpool 5 p.c. Ord. A	211—213	82—84	..
					Liverpool 5 p.c. Ord. B	146—148		
306,088	,,	June 26	4	4%	Do. 4 p.c. Pr. Deb. Stk.	..	71—73	..
75,000	5	June 11	6	3%†	Malta & Mediterranean	4¼—4⅝	3½—3⅝	..
250,000	100	April 1	4½	4½%	Met. of Melbourne 4½ p.c. Deb.	99—101	88—99	..
541,920	20	May 28	4	6/-	Monte Video, Ltd.	11½—12	8⅞—9½	9—9½
1,876,892	Stk.	July 29	4½	3½%	Newcastle&Gatsh'd Con.	98½—99½	64—66	..
629,705	,,	June 26	5½	5½%	Do. 3½ p.c. Deb.	82—88	59—61	..
55,940	10	Feb. 26	1/14/0	7%	North Middlesex 7 p.c.	14—15	9½—10½	..
800,000	Stk.	May 14	8	8%	Oriental, Ltd.	117—122	102—104	..
60,000	5	Mar. 26	10	1/-	Ottoman, Ltd.	7½—7⅝	3—4	..
50,000	50	Feb. 26	18	9%	Portsea, Island B	128—131	78—83*	..
100,000	50	,,	12	6%	Do. C	118—121	73—78*	..
52,000	50	,,	10	6%	Do. D	..	..	..
249,980	5	April 29	8	—	Primitiva Ord.	5½—6	1⅝—1¾	34/6
499,960	5	June 26	5	2/6	Do. 5 p.c. Pref.	4¾—5	2⅛—2⅞	54/5
521,800	100	June 2	4	4%	Do. 4 p.c. Deb.	91—93	75—77	..
—	—	—	—	4%	Do. ,, ,, 1911	..	50—55	..
846,198	Stk.	June 26	4	4%	River Plate 4 p.c. Deb.	85—87	55—60	..
150,000	10	May 14	6	6/-	San Paulo 6 p.c. Pref.	10½—11	7½—7⅞	..
125,000	50	July 1	5	5%	San Paulo 5 p.c. Deb.	47—49	40—42	..
135,000	Stk.	Mar. 12	10	10%	Sheffield A	223—224	..	..
209,984	,,	,,	10	10%	Do. B	223—224	170—178*	..
629,500	,,	,,	10	10%	Do. C	220—222		..
90,000	10	May 28	9	6/-	South African	10½—11½	..	..
6,609,895	Stk.	Feb. 10	5/4/0	32/-	South Met. 4 p.c. Ord.	111—113	65—67	65½—66½
950,000	,,	July 12	—	5%	Do. Pref.	..	91—93	..
1,895,445	,,	July 10	3	3%	Do. 3 p.c. Deb.	72½—74½	53—55	..
224,820	,,	Feb. 26	8½	6⅜%	South Shields Con. Stk.	157—159	118—119	..
952,795	,,	,,	6	3½%	S'th Suburb'n Ord. 5 p.c.	114—116	69—71	70½
60,000	,,	,,	5	5%	Do. 5 p.c. Pref.	110—112	73—75	..
185,000	—	—	—	3½%	Do. West Kent	..	..	..
187,558	Stk.	June 26	5	5%	Do. 5 p.c. Deb. Stk.	116—118	83—85	..
647,740	,,	May 14	5	3⅝%	Southampton Ord.	99—102	72—75	..
120,000	,,	Feb. 12	7½	5½%	Tottenham A 5 p.c.	135—138	88—93	..
782,275	,,	,,	6	4%	Tottenham District B 3½ p.c.	115—117	64—66	64—64½
181,255	,,	June 26	4	4%	Tottenham District 4 p.c. Deb.	87—89	61—63	..
182,380	10	Dec. 30	5	—	Tuscan, Ltd.	5—6	1—2	..
149,900	10	July 1	5	5%	Do. 5 p.c. Deb. Red.	93—95	45—50	..
236,476	Stk.	Mar. 12	5	5%	Tynemouth 5 p.c. max.	108½—109½	87—88	..
					Wandsworth, Wimbledon, and Epsom—			
30,000	,,	Feb. 26	8⅜	63/9	Wandsworth A 5 p.c.	151—156	83—93*	..
255,686	,,	,,	6¼	48/9	Do. B 3½ p.c.	129—134	68—73*	..
108,075	,,	,,	5/17/3	44/7½	Do. C 3½ p.c.	110—115	68—73*	..
852,000	,,	,,	6½	42/6	Wimbledon 5 p.c.	117—122	68—73*	..
98,000	,,	,,	6⅜	48/9	Epsom 5 p.c.	121—126	68—73*	..
88,416	,,	June 26	8	8%	3 p.c. Deb. Stk.	58—60	48—51	..

* Ex Div. † Next Dividend will be at this rate.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official List" for Sept. 4.]

Nos. 13,835—14,196.

BERGMAN, W. D.—"Manufacture of pure aluminium hydroxide and ammonium sulphate." No. 13,873.
BURNEY, C. D.—"Apparatus for distillation of solid carbonaceous material." No. 14,176.
DAVIDSON, W. B.—"Gas-cleaning apparatus." No. 13,938.
DAVIES, C. W.—"Inverted incandescent mantles." No. 13,874.
DILLEY, A. & R.—"Incandescent gas-burners." No. 13,916.
EVANS, I. B.—"Gas-producers, &c." No. 13,957.
JEFFERY, S. F.—"Automatic combined safety gas and air valve." No. 13,914.
KELDAY, A. H.—"Incandescent gas-fires." No. 14,195.
LAMPLOUGH, F.—"Rotary blowers, &c." No. 14,181.
LARSON, J. P. A.—See Bergman. No. 13,873.
LEVI, H.—"Reflector and heat-accumulator for gas lighting and heating." No. 14,020.
LIVERSEDGE, A. J.—See Davidson. No. 13,938.
MANTLE LAMP COMPANY.—See Davies. No. 13,874.
MORRIS, H.—"Process by which coal tar and/or dehydrated coal tar may be utilized in conjunction with mineral and/or shale oils." No. 13,859.
OAKBANK OIL COMPANY.—"Manufacture of sulphate of ammonia." No. 13,842.
SHAPTER, G. H. H.—"Metal fork for upright incandescent mantles." No. 13,946.
STILL, F. G., & STILL & SONS, W.M.—"Apparatus for heating water." No. 13,920.
WISHART, J.—See Oakbank Oil Company. No. 13,842.
WOLSTENHOLME, J.—"Metallic cylinders for compressed-gas containers for motor traction." No. 13,840.

Lymm Power Users' Protests.—At the last meeting of the Lymm (Cheshire) Council the Clerk said that several large consumers of gas had written protesting against the raising of the price. In most places, it was said, the charge for power was less than for other purposes. Mr. J. H. Holt (a member of the Council) suggested that the price to power consumers (4s. 8d. per 1000 c.ft.) should be reduced to the same level as for gas-cookers (4s. 2d.). The matter was referred back to the Gas Committee for re-consideration.

Teignmouth Gas-Works Results.—At a meeting of the Teignmouth Urban District Council, Mr. A. J. Pratt (the Chairman of the Gas Committee), in a statement of the work to March 31, said the gross profit last year was £1053, which was equal to 10·93 p.ct. on the present total capital. The income and expenditure practically balanced each other for the financial year. Rising costs would render it necessary to increase the price of gas by at least 6d. per 1000 c.ft., if the possibility of a considerable deficit at the end of the current year were to be avoided.

Dungarvan Public Lighting.—At a meeting of the Dungarvan Urban Council, the Clerk said that Messrs. Anderson, who had taken over the gas-works, had tendered for the public lighting at £3 18s. 4d. per lamp, and that he had ascertained that the Tipperary Council were paying only £2 1s. 9d. per lamp. Mr. Walsh considered the price mentioned in the tender was prohibitive; and Mr. Maloney said he thought the people would be satisfied to do without lighting rather than pay so much. Mr. Brennock reminded the Council that he had on a previous occasion suggested that they employ paraffin lighting. An order was made that the Council considered the tender too high; and directions were given to have oil bowls in readiness should paraffin lighting be decided upon.

Price of Gas at Sheffield.—The Sheffield Gas Company announce a further advance in the price of gas—the third since the commencement of the war. After the reading of the meters for the Michaelmas quarter, the charge to householders will be 3s. per 1000 c.ft.

Gas-Cookers to be Disconnected at Evesham.—The Evesham Gas Committee have decided that, from the 30th inst., all gas-cookers, except those supplied by penny-in-the-slot meters, are to be disconnected. It is thought that this will be the best way of reducing the consumption of gas to the extent required. Much public inconvenience is, of course, inevitable.

Burnley to Seek Relief.—The Burnley Town Council have decided, on the recommendation of the Gas Committee, to make an application to the Local Government Board for the issue of an Order under the Statutory Undertakings (Temporary Increase of Charges) Act, to partially amend the Local Improvement Act so as to increase the maximum price of gas sold by the Corporation in the borough from 3s. to 3s. 6d. per 1000 c.ft.

Substitution of a Flat-Rate at Morecambe.—At the monthly meeting of the Morecambe Town Council, it was decided to abolish the existing differential rates for lighting and heating, and to substitute, as from Oct. 1, a flat-rate of 4s. 6d. per 1000 c.ft. subject to a discount of 3d. This is an increase of 6d. per 1000 c.ft. Mr. Knowles (the Chairman of the Committee) explained that the cost of production had increased £3000 a year; and the new charges would not more than meet the increased expenditure. They had endeavoured to get over the difficulty by the introduction of labour-saving machinery. Under the new arrangements, instead of having separate meters for lighting and cooking, they would be able to remove one meter, which would enable them to carry on in face of the difficulty of getting new meters, and repairs to existing ones.

Owing, says "The Times," to the bursting of an electric globe at the Great Hampton Street Picture House, Birmingham, on Saturday, a panic occurred among the children in the building, and a number were injured.

The Wakefield Gas Company have received an intimation from the Fuel Controller that it has been found necessary, at least for a period, to divert over 50 p.ct. of the coal which should be going to the local gas-works.

A verdict of "Suicide while temporarily insane" was returned in the case of William Shoesmith, of Bradford, who lived alone at Darton Street, and was found dead in bed with a sheet over his head and a gas-tube near his mouth. The gas was turned on.

Collieries are now receiving forms in which they are asked for details of output, disposal, and sales of coal in June last. Particulars are required of the quantity of each grade of steam and manufacturing, gas, and coking coals supplied to each consumer for inland consumption.

NEWSPAPERS FOR NEUTRAL COUNTRIES.

The Secretary of the War Office has issued the following order:

> The public are informed that newspapers and other printed publications will not be sent to Neutral Countries unless they are posted direct from the office of publishers or newsagents who have obtained permission from the War Office for this purpose. Persons desiring to send newspapers, &c., to Neutral Countries should, therefore, give their orders for execution to publishers or newsagents who have obtained such permission.

The Publisher of the "JOURNAL" has obtained the required permission of the War Office; and he will, on receipt of instructions, forward copies direct from the office to any neutral country.

WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Appointments, &c., Vacant.

GAS ENGINEER AND MANAGER. Carlisle Corporation. Applications by Sept. 20.
MANAGER (Tar Distillery). No. 6493.
ASSISTANT ENGINEER AND MANAGER. Bath Gas Company. Applications by Sept. 18.
DRAUGHTSMAN. Sheffield Gas Company.
ASSISTANT (Male or Female) TO CONSULTING CHEMIST. No. 6494.
PURIFYING FOREMAN. Saltley Gas-Works, Birmingham.
GENERAL FOREMAN. Keighley Gas Department. Applications by Sept. 25.
FOREMAN FITTER. Saltley Gas-Works, Birmingham.
STOKERS. Honley Gas-Works.

Appointments, &c., Wanted.

ENGINEER, &c. (Discharged Officer). No. 6491.
GAS FITTER. No. 6496.
AGENCY (Gas Fittings). No. 6495.

Plant, &c., for Sale.

GAS PLANT BLOWER. Cardiff Gas Company.
PURIFIERS. Shirebrook Gas-Works.
RETORT BENCH IRON AND BRICK WORK. Johnstone Gas-Works.
EXHAUSTER SET. Stratford-on-Avon Gas-Works.

Plant, &c. (New or Second Hand) Wanted.

GAS RADIATORS. Blue Bird Motor Company.
WEIGHING MACHINE. Sidmouth Urban District Council.

Meeting.

BRITISH GAS LIGHT COMPANY. No 11, George Yard, Lombard Street, E.C. Sept 25, Twelve o'clock.

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